REPORT ON THE OPERATIONS OF THE DEPARTMENT OF AGRICULTURE MADRAS PRESIDENCY

FOR THE YEAR

1938-39

MADRAS
PRINTED BY THE SUPERINTENDENT
GOVERNMENT PRESS
1940

Price, 8 annas

CONTENTS

R.O.C. No. D. 68-Pdl./39.

OFFICE OF THE DIRECTOR OF AGRICULTURE,
MADRAS, *dated the* 30*th October* 1939.

From

P. H. RAMA REDDI, ESQ., I.A.S.,
Director of Agriculture,
Madras,

To

THE SECRETARY TO GOVERNMENT,
Development Department,
Fort St. George, Madras.

SIR,

[Administration Report—Agricultural Department—1938–39.]

I have the honour to submit the following report on the operations of the department for the year 1938–39.

The report covers a period of 15 months from 1st April 1938 to 30th June 1939 unlike in previous years when it extended to only 12 months of the financial year from 1st April to 31st March next year. The change is due to the orders passed by Government that from the year under report onwards the annual report of the Agricultural Department should correspond to the agricultural or fasli year instead of financial year.

I.—ADMINISTRATION.

2. I continued to be in charge of the department throughout the period under report.

During the year, I attended the meetings of the Irrigation Development Board at Madras, the Sugar Committee meeting at Simla, the meetings of the Indian Central Cotton Committee at Bombay and Lyallpur and the meetings of the Advisory Board of Imperial Council of Agricultural Research at Delhi and Simla.

3 The outstanding events during the year were the re-amalgamation of the teaching section with the research section of the Agricultural College, Coimbatore, and the decentralization of accounts which were hitherto dealt with in the Central Office under the control of the whole-time Principal. As a result of these changes, the head of each scientific section became responsible both for research and teaching in his subject, and the post of the whole-time Principal and one post of gazetted Assistant in the Chemistry section and another in the Mycology section became superfluous. The post of whole-time Principal was converted into Senior Lecturer in Agriculture and Superintendent, Central Farm, while the other two posts were abolished. The seniormost officer

in the College estate was entrusted with the duties of Principal, and he, besides being the head of his section and responsible for the teaching of his subject, is also responsible for the administrative duties of the College estate. To assist him in his work of teaching and research a post of gazetted Assistant is sanctioned in lieu of the temporary post of Superintendent, Central Farm. The designation of the Lecturer in Agriculture was also changed into Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm.

The post of Estate Mechanical Engineer is held in abeyance and his work is re-distributed between the Estate Civil Engineer and the Research Engineer. The Research Engineer is also made responsible for the teaching of Mechanical Engineering.

Another important feature was the decision taken by Government to replace the gazetted Superintendents of Agricultural Research Stations by non-gazetted senior Upper Subordinates. In giving effect to this decision, the post of Superintendent, Kovilpatti, was first retrenched with effect from 3rd March 1939.

Leave, transfer, appointment, confirmation, etc.

4. Consequent on the re-amalgamation of teaching with research, Mr. R. C. Broadfoot was appointed as Senior Lecturer in Agriculture and Superintendent, Central Farm, and also as part-time Principal.

Mr. A. C. Edmonds, Deputy Director of Agriculture, Bellary, went on leave out of India from 20th April 1938 and Mr. D. G. Munro, Deputy Director of Agriculture, Coimbatore, continued to be on leave till 8th December 1938. The two officers have since retired from service on proportionate pension, the latter from 9th December 1938 and the former from 7th April 1939.

Mr. Saadat-ul-lah Khan, Deputy Director of Agriculture, St. Thomas' Mount, on the abolition of the old IV Circle, availed himself of one month's leave from 21st June 1938 and on the expiry of the leave joined the new III Circle at Trichinopoly as Deputy Director. He again proceeded on leave for 10 months and 15 days from 3rd January 1939.

Madras Agricultural Service.—Consequent on the reduction of Circles from eight to four and the increase of Assistant Directors from ten to thirteen and the re-grouping of circle charges for which the sanction of Government was received towards the end of March 1938 and coupled with the re-amalgamation of teaching with research at the College, there have been too many changes of officers particularly in the district administration, which were unavoidable.

At the Agricultural College, Coimbatore, Sri V. G. Dhanakoti Raju who held the post of temporary Superintendent, Central Farm, till 31st July 1938, was replaced by Sri A. Chinnathambi Pillai who continued as Superintendent till 14th August 1938. Consequent on the abolition of this post and creation in its place of the post of gazetted Assistant to the Principal, Sri A. Chinnathambi Pillai

became the gazetted Assistant and he continued in that capacity till 3rd January 1939 when he was relieved by Sri M. Kanti Raj Nayudu.

Sri C. Ramaswami Nayudu joined the College as Lecturer in Agriculture on 23rd June 1938 and consequent on the change of designation of this post he became the Junior Lecturer in Agriculture and Assistant Superintendent, Central Farm. He continued at the College till 28th March 1939 when Sri Kanti Raj relieved him and held additional charge of the post.

In the I Circle, Sri V. N. Subbannacharya continued as Assistant Director of Agriculture, Vizagapatam, till 2nd October 1938 when the permanent incumbent, Sri Rao Sahib G. Jogi Raju, resumed charge on expiry of his leave. This officer proceeded on long leave from 3rd January 1939 preparatory to retirement and was succeeded by Sri P. Subrahmanyan.

Sri Y. G. Krishna Rao Nayudu, Deputy Director of Agriculture, Guntur, was, on the abolition of the circle, appointed as Assistant Director of Agriculture, Guntur, from 22nd June 1938. He continued in this post till 20th September when he was succeeded by Sri A. Gopalakrishnayya Nayudu.

Sri M. Kanti Raj Nayudu, Superintendent, Agricultural Research Station, Anakapalle, was transferred to Coimbatore, and Sri A. Ramaswami Ayyar, who was posted in his place, joined at Anakapalle on 3rd January 1939.

In the new II Circle, Sri T. Budhavidheya Rao Nayudu, on abolition of the post of Deputy Director of Agriculture, VI Circle, Madura, was transferred to Bellary as Deputy Director of Agriculture.

Sri A. Ramaswami Ayyar continued as Assistant Director of Agriculture, Bellary, till 15th September 1938 when he was relieved by Sri Y. G. Krishna Rao Nayudu, who in turn was relieved by Sri V. N. Subbannacharya on 23rd December 1938.

Sri R. Swami Rao continued as Assistant Director of Agriculture, Cuddapah, till 22nd May 1939 when he was succeeded by Sri K. Raghavacharya.

Sri S. Narayana Ayya, Assistant Director of Agriculture, Nellore, was granted leave from 27th October 1938, and Sri A. Ramaswami Ayyar was posted in his place. He continued there till 3rd January 1939 when Sri V. G. Dhanakoti Raju succeeded him. This officer remained at Nellore only for a short period when he proceeded on leave preparatory to retirement. His place was filled by Sri L. Narasimhacharya till 11th April 1939 when Sri R. N. K. Sundaram took his place.

A new post of Assistant Director of Agriculture was sanctioned with headquarters at St. Thomas Mount and Sri A. Gopalan Nayar filled the post from 20th June 1938.

The new III Circle was formed on 21st June 1939. Sri R. N. K. Sundaram was in charge of this circle till 28th July 1938 when he went back to Madura as Assistant Director of Agriculture. Sri A. Gopalan Nayar continued at Tinnevelly as Assistant Director of Agriculture till 11th June 1938 when he was succeeded by Sri E. Kunhappa Nambiyar. Sri R. N. K. Sundaram remained at Madura till 3rd December 1938 when he proceeded on leave till April 1939. His place was filled by Sri A. Chinnathambi Pillai who continued at Madura till 17th June 1939 when he went on leave preparatory to retirement. He was succeeded by Sri E. Kunhappa Nambiyar, the latter's place at Tinnevelly being taken by Sri R. Chokkalingam Pillai whose place at Kovilpatti as the Farm Superintendent having been abolished.

Sri P. Subrahmanyan continued to be the Special Assistant Director of Agriculture at Pattukkottai till 23rd December 1938 and he was succeeded by Sri S. Narayana Ayya.

During the absence of Mr. Saadat-ul-lah Khan on leave from 3rd January 1939, Sri Y. G. Krishna Rao Nayudu was transferred to Trichinopoly as Deputy Director of Agriculture and he joined duty there on 3rd January 1939.

The new IV Circle with headquarters at Coimbatore was formed on 23rd June 1938, when Sri K. Unnikrishna Menon joined duty. He continued as Deputy Director till 29th March 1939 when he was relieved by Sri C. Ramaswami Nayudu.

Of the three additional posts of Assistant Directors of Agriculture sanctioned by Government in lieu of four posts of Deputy Directors retrenched, two posts were allotted to IV Circle, one at Tellicherry and another at Coimbatore. Sri M. U. Vellodi took charge of the former post on 16th June 1938 and Sri K. Avudainayakam Pillai, the latter, on 27th June 1938.

The headquarters of the Assistant Director of Agriculture in charge of Salem and North Arcot districts which were hitherto at Salem were shifted to Tiruppattur with effect from 13th December 1938.

Sri V. K. Subrahmanya Mudaliyar held the post of Superintendent, Potato Research Station, Nanjanad, financed by the Imperial Council of Agricultural Research till 11th June 1938 on which date the term of the temporary post terminated.

Sri V. Ramanatha Ayyar, Cotton Specialist, availed himself of leave from 3rd January 1939 to 2nd March 1939 and Sri R. Chokkalingam Pillai, Superintendent, Kovilpatti, acted for him.

The services of Dr. J. S. Patel were lent to the Indian Central Jute Committee for employment as Jute Specialist for a term of three years and he was relieved from the post of Oil Seeds Specialist on 18th November 1938. Sri Rao Bahadur G. N. Rangaswami Ayyangar, Millets Specialist and Geneticist, held additional charge of that post till 31st January 1939 when he handed over charge to Mr. C. M. John who was appointed as

officiating Oil Seeds Specialist. Sri C. R. Seshadri, Assistant in Oil Seeds, was selected for the Madras Agricultural Service and he was appointed as Superintendent, Groundnut Research Station, Tindivanam, in succession to Mr. C. M. John with effect from 5th February 1939.

Sri K. T. Alwa, Headquarters Deputy Director of Agriculture, proceeded on leave for four months from 6th April 1939 and in his place Sri K. Unnikrishna Menon, Deputy Director of Agriculture, IV Circle, was appointed to officiate.

Sri M. Sanyasi Raju, Assistant in Bacteriology, was appointed as Agricultural Bacteriologist from 25th April 1938 to 30th June 1938 during the absence of Mr. Paul D. Karunakar on leave.

Sri M. Vasudeva Rao Nayudu, Farm Manager, Samalkota, acted as Superintendent, Agricultural Research Station, Anakapalle, for two months from 2nd August 1938 during the absence of Sri M. Kanti Raj Nayudu on leave.

In connexion with a scheme for the improvement of Mungari cotton in the Bellary district a post of gazetted Assistant financed by the Indian Central Cotton Committee was sanctioned for a term of five years and Sri R. Balasubrahmanyam, gazetted Assistant in charge of Herbeceum Scheme, was appointed to that post with effect from the 4th April 1938. He continued in that post till 21st August 1938 when he was succeeded by Sri V. K. Subrahmanya Mudaliyar. During the absence of Sri R. Balasubrahmanyam, Sri C. Jagannatha Rao, Assistant in Cotton, was appointed as gazetted Assistant, Herbeceum Scheme, and he held this post from 9th April 1938 till the scheme was closed on 31st May 1938.

Another post of gazetted Assistant was sanctioned for a term of five years for research work on coconuts financed by the Imperial Council of Agricultural Research. Sri G. Venkatanarayana, Assistant in Oil Seeds Section, was appointed to this post from 15th September 1938 with headquarters at Kasaragod.

Mr. N. G. Charley who had been engaged as Research Engineer on contract was permitted to terminate his contract before the expiry of his term. He handed over charge to Sri B. M. Lakshmipathi Mudaliyar on 28th April 1938 who held charge of that post in addition to his own till 16th October 1938. He was thereafter appointed as Officiating Research Engineer, his permanent post of Estate Mechanical Engineer being held in abeyance.

The temporary posts of Assistant Director of Agriculture, Pattukkottai, Assistant Marketing Officer for Development work, Soil Physicist and the Superintendent, Dry Farming Station, Hagari, were continued during the year.

Madras Agricultural Subordinate Service.—There was no increase in the permanent cadre of Upper Subordinates during the year with the exception of an addition of one post in the new I Grade in the Agricultural Section which was sanctioned in

lieu of a gazetted post of Superintendent in the Cotton Section retrenched. On the other hand, 13 posts of Upper Subordinates were abolished as a measure of economy, six in Science Section and seven in Agricultural Section.

Consequent on the transfer to the Veterinary Department of the Livestock Section, the cadre of Upper Subordinates was reduced by six and that of Lower Subordinates by two.

II.—Agricultural Education.

5. *Agricultural College, Coimbatore.*—During the year 1938, 187 applications were received for admission to the College as against 184 in the previous year, and 133 candidates appeared for interview before the Selection Committee at Waltair, Madras and Coimbatore; 42 of them were selected and 22 were placed in the waiting list. Only 31 of the selected candidates joined the College and 10 seats were filled from the waiting list. Two students from Orissa and one from Coorg were also admitted. With the re-admission of three failed students the final strength of Class I stood at 47.

During the year 1939, 232 applications were received and 181 candidates appeared for interview; 48 of them were selected and 22 were placed in the waiting list. Only 37 of the selected candidates joined the College, one of whom resigned after joining and 11 were admitted from the waiting list. Two students from Hyderabad were also admitted. The final strength stood at 50 including one failed student who was re-admitted.

The following table shows the number of students newly admitted from each community :—

	1938.	1939.
Brahmans	24	18
Non-Brahmans	7	6
Muhammadans	2	5
Christians	1	6
Backward	10	14
Total ..	44	49

Scholarships.—Of the five scholarships for the first year students of 1938, two were given to Muhammadans and three to backward classes. The scholarship awarded to a student of the backward class during 1937 having fallen vacant owing to his failure to qualify for promotion to the second year class, it was re-allotted to a student of Class II during his second year course. Two students who had a reference in one subject in the second examination were allowed to continue to enjoy the scholarships under the sanction of Government. Of the five scholarships for the first year students of 1939, one scholarship was for a scheduled class student. As there was no student from that class this year, it is proposed to distribute the five scholarships—two to Muhammadans and three to students of backward class.

Examinations.—The results of the B.Sc.Ag. examinations in 1938 and 1939 are as follows :—

1938.

	Number appeared.	Number passed.	
First examination ..	48	38	
Second examination..	38	31	*plus* 6 failed in one subject only and were eli ible for attending B.Sc.Ag. Class III.
Final examination ..	38	26	Seven candidates were referred in one subject.

Twelve candidates referred from the second examination in previous years appeared this year. Nine of them passed and the remaining three were referred again. All the five candidates referred from the final examination in 1937 appeared and passed, bringing the total qualifying for the degree to thirty-one.

1939.

	Number appeared.	Number passed.	
First examination ..	49	41	
Second examination..	37	29	5 failed in one subject and permitted to join B.Sc.Ag. Class III.
Final examination ..	35	29	5 failed in one subject.

Nine candidates referred from the second examination in 1938 appeared, and seven of them passed and the remaining two failed. All the twelve candidates referred from the final examination in 1938 appeared and passed bringing the total qualifying for the degree to 41.

Lectures and tours.—Consequent on the re-amalgamation of teaching sections with research sections, heads of research sections are made responsible for teaching in their respective subjects. Special lectures normally given by them were abandoned.

Arrangements were made from this year to afford better training to students in curd and ghee making by increasing the number of hours in Dairy practice. The Dairy Manager was deputed to attend a refresher course at the Imperial Institute of Animal Husbandry and Dairying, Bangalore.

Besides the week-end short trips in the adjoining villages, students of Class III and Class II were, as usual, taken on long tours during October 1938 and January 1939 respectively.

6. *Agricultural Middle Schools.*—The school at Usilampatti was closed in April 1938. It was amalgamated with the local High School.

7. *Farm Labourers' Schools.*—The three schools at Anakapalle, Palur and Coimbatore continued to function. At Anakapalle there were on the rolls 24 boys on the average during the year which is the same as in last year, and 34 adult labourers in the Night School. At Palur, the average strength of the school increased to 44 against 34 in the previous year. The increase was due to the abolition of the school in a neighbouring hamlet. At Coimbatore, there were 10 boys with wages and 18 boys without wages as against 1 and 19 respectively during the previous year.

8. *Short courses in Practical Agriculture.*—The following short courses were conducted during the year at the Agricultural College, Coimbatore :—

Course.	Number of students admitted.
1 Farm Management	9
2 Horticulture and Vegetable Gardening ..	2
3 Insect pests and diseases	3
4 Dairying	3
5 Care of animals	4
6 Bee-keeping	5
7 Jaggery making	4
8 Farm implements and machinery and manures.	4

The students attending "Farm Management" course had their training along with other students in special courses, items 2 to 8.

The short course in Agriculture was continued this year also at the Agricultural Research Station, Nandyal. Eight applications were received, three were selected and only one completed the course. In addition to this, 31 pupil teachers of the S.P.G. Training School, Nandyal, were given training in both theoretical and practical agriculture at the station. There was no short course at Taliparamba.

Twenty-three students underwent training in Fruit culture and nursery practices at the Fruit Research Station, Kodur. In addition to these, ten Upper Subordinates and two maistries were trained.

9. *Dairy.*—The dairy herd consisted of 26·4 cows on an average during the year as against 27·9 cows in the previous year. 18·6 of them were in milk. The average daily yield per cow in milk was 16·3 lb., the average yield over all being 11·5 lb. compared with 10·5 lb. in the previous year.

The total milk yield for the 15 months under report amounted to 138,509 lb. including 990 lb. purchased from outside for special

needs. The quantity handled in the previous year for 12 months was 110,909 lb. The milk was disposed of as follows :—

	1938–39.	1937–38.
	LB.	LB.
Sold	90,765	83,840
Fed to calves ..	14,391	8,123
Separated	32,457	17,667
Colostrum for exhibition, demonstration, etc.	1,820	1,279
Balance—deficit ..	66	..

Out of 32,457 lb. of milk that was separated, 3,260 lb. of cream was obtained and 3,212 lb. of this cream was converted into butter and the quantity of butter obtained was 1,774 lb.; 1,367½ lb. were sold as butter and the remainder was converted into ghee or utilized for dairy purposes. In the previous year, 996 lb. of butter were obtained from 1,774 lb. of cream; 937 lb. of butter were sold and 20 lb. converted into ghee.

The receipts by the sale of eggs and poultry amounted to Rs. 937-6-4, against Rs. 1,063 in the previous year.

10. *College Day and Conference.*—The 27th College Day and Conference was held from the 21st till the 24th July 1938, under the presidency of the Hon'ble Sri V. I. Muniswami Pillai, Minister for Agriculture and Rural Development. There was a large and enthusiastic attendance at all the sessions. An Agricultural Exhibition was also arranged during the Conference and this attracted a large number of visitors.

III.—SEASON.

11. Summer showers in April-May 1938 were unusually heavy in the West Coast, somewhat heavy in Guntur and normal in the Central districts, Circars and the South-east Madras. The south-west monsoon of 1938 started earlier than usual, about the 26th May in Malabar. It gathered full force in June-July and rainfall was generally well distributed until the latter half of July when it slackened. The fall in June was slightly in excess in the West Coast, North Arcot and the Circars, moderate in Cuddapah, Kurnool, Nellore, Tanjore and the Carnatic and defective elsewhere. In July it was in slight to moderate excess in the West Coast, Madura and Salem, and normal in East and West Godavari, Kistna, Bellary, North Arcot, Coimbatore and Trichinopoly. There was abundant rainfall in August in all the districts except Vizagapatam, parts of East Godavari and the West Coast. September rains were above normal in the Circars, Nellore, Deccan, Chittoor, North Arcot, South Kanara and the South (Tanjore excepted). On the whole, the south-west monsoon was fairly satisfactory and the sowings of crops favoured by this monsoon were normal or above normal. The condition of standing crops in parts of Vizagapatam, Kistna and Tinnevelly was not satisfactory. Prices of food-grains were generally stationary.

As a contrast, the north-east monsoon of 1938 started late in the last week of October and was practically a failure. The rainfall in October was far below normal in all the districts except Vizagapatam which received more than the usual amount of rain. A cyclonic storm formed in the South Andaman sea on the 23rd November, moved on in a north-westerly direction, crossed the Madras coast near Masulipatam on the 26th and ended there. The rainfall associated with it was widespread, heavy locally and torrential in East and West Godavari and Kistna. The heavy fall resulted in complete inundation of fields and caused considerable damage to paddy and other standing crops in these districts. The rainfall was in defect elsewhere during this month. The monsoon was weak in December and the rainfall in the month was below the normal in all districts except the Nilgiris, Ramnad and Madura (Periyar Valley). There were a few showers between the 9th and 11th January 1939 in the South-east Madras and the monsoon considerably weakened thereafter.

The failure of the north-east monsoon throughout the province resulted in crops withering, the tracts most severely affected being parts of the Central districts and the Carnatic. Paddy in Tanjore and Trichinopoly was considerably affected by "Soorai" disease owing to drought. The only good feature of the year was that, contrary to expectations, the yield of cotton in Cuddapah and Kurnool districts was above normal. The extent of area cultivated up to December 1938 was a little less than that of the previous year in the case of both wet and dry crops.

The summer rains of 1939 were fairly good in North Arcot, Salem, Vizagapatam, South and Trichinopoly. In parts of Tanjore there were unusually heavy rains in April-May followed by a severe cyclone with the attendant loss of cattle, sheep and the plantain crop. The summer was very severe in the West Coast, notwithstanding a heavy downpour in April. The 1939 south-west monsoon commenced in the second half of June but was very weak.

The effect of the season on the crops at the various Agricultural Research stations.—Anakapalle was the only Research Station which had an even distribution of south-west monsoon rains enabling vigorous and healthy growth of paddy and sugarcane crops. The heavy winds of November 1938, however, damaged the sugarcane crop. In the rest of the Research Stations other than Nandyal and Hagari almost all dry crops failed as a result of the precarious north-east monsoon rains. At Maruteru and Samalkota the terriffic storm and the heavy downpour on the 25th and 26th November 1938 threw flat on the ground the standing crops of plantain and sugarcane while paddy in ears was completely submerged in water at Maruteru. Damage was also caused to the trees and buildings in both the stations and the implement shed at Samalkota was blown down. In Guntur,

tobacco planting was partially delayed and the crops planted late did not come up satisfactorily. The yields of cotton and cholam were above the normal at Hagari and Nandyal, jonna being affected by "Sugary exudation." The heavy rains of September at Siruguppa in the Tungabhadra Project area caused erosions in the newly laid out fields. The failure of rains in subsequent months of the north-east monsoon coupled with the unprecedented drought that followed right up to June 1939 resulted in extreme desiccation of the soil and consequent development of cracks. At Kodur, the off-season mango crop was, to some extent, benefited while the normal season crop of oranges had to be protected by irrigation at the close of 1938. Yield of paddy was good at Palur, Ambasamudram and Buchireddipalem, and set up a new record at Aduturai despite low rainfall and bad distribution. Sugarcane at Gudiyattam and paddy at Pattambi had to be maintained by lift irrigation. The yield of groundnut at Tindivanam was low and the quality was very bad, while second flush of cotton at Kovilpatti was practically a failure. The Central Farm and the breeding stations at Coimbatore suffered most and all dry crops failed. The rainfall recorded at the Central Farm was the lowest for 33 years and the yield of Chitrai cholam was the poorest on record. Taliparamba and the coconut stations on the West Coast fared a little better. At Nanjanad, the season was favourable for potato but not for samai or for the growth of fruit trees in the Nilgiris fruit stations. In the Cauvery-Mettur Project area at Pattukottai the failure of the north-east monsoon affected the Samba and Thaladi paddy to an appreciable extent and "Soorai" disease also made its appearance.

IV.—Research.

A.—*Chemistry.*

12. The work of this section was, as usual, confined to the investigation of problems concerning the soil science, biochemistry of plants and animals and jaggery and malt-making. A large number of samples, 2,454 as against 2,541 in 1937–38, of soils, manures, feeding stuffs, waters for irrigation, human foods for the use of prisoners and hospital patients and other agricultural products were analysed for the public and Government departments and advice was offered on them.

The work on reclamation of alkaline soils was continued in the Kattalai High Level Channel area in the Kulittalai taluk of the Trichinopoly district. The plots treated in 1937 with gypsum at 10 tons per acre, and sulphur at 1 ton and 2 tons per acre were sown to green manure in May 1938. The crop put on good growth in gypsum treated plots and fair growth in sulphur treated plots and it was ploughed in. Paddy seedlings (Sadai Samba) were transplanted in all the plots in October 1938. The crop came up satisfactorily and gave an average yield of 1,050 lb. paddy and 1,450 lb. straw per acre in spite of adverse season. The seedlings

in untreated check plots withered away and produced no crop. The yields in treated plots did not compare unfavourably with the yields on neighbouring lands said to be almost free from alkalinity. The analysis of soils also showed marked improvement in the treated plots. Gypsum is available in abundance in the adjacent taluk of Perambalur.

A similar experiment was also started in one of the alkaline fields in the Central Farm, Coimbatore, which had a high pH and high soluble content, chiefly as carbonates and bicarbonates with consequent low cropping capacity. The experimental plots were treated with sulphur at ½ ton and 1 ton per acre and molasses at 1 tons and 6 tons per acre and sown to cholam. The crop was poor in all plots. Analysis of soils after three months, however, showed a market fall in the pH and the carbonate and bicarbonate content in the sulphur treated plots. No such change was observed in the molasses-treated plots.

Comparative studies of the black soils of the Central Provinces and Madras Deccan show that they are alike in many respects as the result of their formation from two types of rock similar in mineralogical composition and differ only in Fe_2O_3 content which is higher in the Central Provinces soils. The black soils of the Central Provinces resemble closely those of Madras Deccan with a high clay content and a pH of 8·5—8·8 but showed no depth distribution of salt in profile. The SIO_2/R_2O_3 molar ratio of the clay complex of the Central Provinces soils was of the order of 2·7—3·0, which was slightly lower than that of the soils of Madras Deccan.

A preliminary investigation was started during the year for ascertaining the quantity of organic carbon present in black soils of the Bellary district. The results indicate that these soils when grown with unirrigated crops contain very low organic carbon content, mostly concentrated at the surface and equally low nitrogen content, the C/N ratio being in the neighbourhood of 25 in the upper layers and gradually decreasing with depth. In the irrigated soils, however, the C/N ratio is about 10 on the surface and increases up to 24 at the depth of 2—3 feet. In the red soils of the same area the C/N ratio is below 10 at all depths. The low nitrogen and organic matter content of black soils of the proposed Tungabhadra project area is a matter to be tackled at an early date.

Studies on the effect of irrigation on black soils have commenced at the Agricultural Research Station, Siruguppa.

In the manurial experiments, no residual effect of molasses was once again noticed on paddy in the fourth year and molasses therefore seems to stand condemned as a source of organic matter as a substitute for green leaf on paddy.

Paddy seedlings raised in a nursery heavily manured, gave significantly higher yields than those raised with less manure when they were transplanted in fields under identical conditions. The experiment will be continued.

The effect of application of ammonium sulphate on the herbage of cereal crops was that while it increased the nitrogen content in the plant, the greater part of the nitrogen remained in the form of nitrates and was of little value as food.

Investigations on protein requirements of working bullocks was continued and all the data so far collected were subjected to statistical analysis. The equation to connect intensity of work and nitrogen requirement showed that the nitrogen requirement was a linear function of the work done. Similarly the endogenous nitrogen as shown by urinary nitrogen output was a linear function of the work done. Based on the results obtained from investigations on animal nutrition, feeding standards have been formulated with paddy and cholam straw and a variety of concentrates, on the basis of protein requirements, at maintenance and various levels of work. These rations will be tried in the Agricultural Research Stations.

Studies on photo nitrification showed no signs of nitrification in sterilized soils even after they were exposed to sunlight for 600 hours while nitrification was affected in unsterilized soils whether exposed to sunlight or not.

An investigation of preliminary character was carried out in collaboration with the Imperial Dairy Expert for finding out a suitable method of transporting milk by train to distances of about 250 miles on the assumption that the period required from the time of milking to marketing is 12 hours. The results indicate that under conditions prevailing in South India in ordinary luggage vans, pasteurization is the best method of processing milk to keep it fresh and reasonably free from contamination. Milk keeps best in mud pots.

Cholam malt was supplied to the Surgeon-General, Madras, for testing on patients in some of the hospitals under his control. The reports so far received are, in general, favourable. The tests are being repeated in Government hospitals and are also extended to private hospitals. Malt was prepared successfully from rice, ragi and wheat also. Rice malt lends itself to blending with cholam malt for making foods and is also favourable for preparation of malt extracts. A range of therapeutic products was prepared from ragi malt extract by blending it with "Galliol," a fish liver oil produced by the Madras Fisheries Department and said to have a Vitamin A potency of ten times that of imported cod liver oil.

Active carbon was prepared from paddy husk on a large scale for use in jaggery-making. A filter has been designed with a side tube like syphon which draws off the clear filtrate and shortens the period of filtration.

In the manufacture of open pan sugar from cane and coconut palm juice rab struck at 118°C gave best yield of sugar and by continuing to keep the rab at about 55°—60°C better crystals of sugar were obtained.

B.—Botany.

Systematic Botany and Horticulture.

13. As a result of the amalgamation of teaching and research the Systematic Botany and Herbarium section was transferred from the Principal, Agricultural College, to the Millets Specialist and Geneticist and continued to be under the immediate control of the Lecturer in Botany.

Two hundred and eighty botanical specimens were collected during the year from the Chittoor and South Kanara districts for the Herbarium. One thousand three hundred and forty-two specimens collected in 1938 and in previous years in the Chittoor district and Coorg and 3,866 specimens of Upper India and exotics were removed from the general collection and incorporated after being labelled and ledgered. Twenty thousand seven hundred and ten sheets from Asclepiadaceæ to the end of Cryptogams were transferred to the new genus and species covers, after arranging them according to districts and noting their distribution on the covers.

In addition, 1,630 specimens were identified for the Herbarium and various officers of the Agricultural, Forest, Veterinary and Live-stock Development Departments and also for the Chemical Examiner, the Tea Scientific Officer, the Government Museum, a few educational institutions and other officials and private individuals.

The Botanic Gardens at Ootacamund and the Sim's Park at Coonoor were, as usual, maintained in proper condition. The roads and garden paths claimed frequent attention due to heavy rains. Flower beds were kept occupied throughout the year with a succession of suitable flowering plants. At Ootacamund the marshy patch of the lawn around the pond near the Curator's office was properly drained and its defects rectified. The conservatories were kept attractive by frequent changes of plants and the glass house and open nurseries were maintained in good condition. Several additions were made during the year to the garden collections by purchase and interchange of plants and seeds and 5,189 seedlings, 437 bulbs and bulbous plants, 302 cuttings, 25 lb. of tree seeds and 89 packets of flower seeds were sold. Two hundred pounds of Jalap tubers collected from different parts of the garden were planted in one of the specially prepared beds for medicinal plants. The seedlings of Lobelia inflata obtained last year from the United States of America were potted but their growth has not been satisfactory. Seventy-two plants have been successfully raised from Barosma betulina seed obtained from South Africa and some of them have also been potted. At Coonoor the bare patches on the slopes and hollows in different parts of the park were filled in. A rockery was made in the wild garden and planted with suitable succulent plants. The two islands in the lake were connected by a rustic bridge and in one of the islands a flower bed was made with a chestnut seedling planted in the centre. The nursery was

completely overhauled and 14,250 cuttings of ornamental trees, shrubs and herbaceous plants were planted in addition to a large number of seedlings raised from the seed collected in the Park. Nine new varieties of roses were added to the collection. Michelia Champaca introduced last year is coming up satisfactorily and the Tung oil trees are putting on good growth, the tallest of them being now 10 feet in height and 5½ inches in girth at 4 feet from ground. One thousand three hundred and eighteen flower plants and shrubs, 58 standard roses, 29 packets of flower seeds and 1 lb. of tree seeds were sold during the year.

C.—Crops.

Cereals.

(1) *Paddy.*

14. *Strains released for distribution.*—Three more strains of paddy were released during the year under the names of Ptb. 11, Adt. 18, and Adt. 19, bringing the total number of improved strains issued by the paddy section to 62. Ptb. 11 is a selection from Halliga, a local variety in the South Kanara district and yields 30 per cent more than the latter. It is meant to replace Halliga. Adt. 18 and Adt. 19 give 12·5 per cent and 19 per cent more yield respectively than the local mixtures which they are intended to replace in the Tanjore delta.

Strains awaiting release.—Two hybrid strains, 10905 and 10783, have been found suitable for areas subject to submersion and will be tried under local conditions in the Kaikalur area of Kistna district. Strain No. 5109 has given 17 per cent more yield than the control under normal agricultural conditions in Erode, Madura and Karur tracts and demand has already been created for it in centres of its trial. Three blast resistant strains, 10998, 11340 and 11348, isolated from a cross between G.E.B. 24 and Korangu samba were again tested in Tanjore, Nellore and Cuddapah districts. In the Tanjore district their merit lies only in disease resistance as in years free from disease none were better yielders than Adt. 10, a strain already under distribution. In the other two districts, however, they were found better yielders than local Molagolukulu and Nellore Pishanam. At Aduturai a cross 7306 between Adt. 2 and Adt. 3 has proved equal in yield and superior in quality of grain to Adt. 3. Strain 4971, a selection from Thattan samba, has given an average increase of 12·4 per cent over the unselected bulk. Similar results have also been obtained from strains 4942 and 5091 selected from Pedda Samba and Chinna Samba respectively. Three other strains 4677 from Molagolukulu and 4772 and 4814 from Vadan Samba have given an average increase of 7·7 per cent, 10 per cent and 18·5 per cent respectively over the standards with which they were compared. At Pattambi, Ptb. 2 (Ponnaryan) recorded 22 per cent higher yield than Kayama, a popular variety of the South Kanara district. Two strains, 1963

and 1970 from Kayama and two strains, 2357 and 2365 from Maskati have been marked out for district trials next year. At Maruteru, strain 3156 was found to yield under local conditions slightly better than Mtu. 6 which is already under distribution and also to withstand submersion for short periods. Two deep water paddy cultures, D.P. 10 and 41, appear to be suitable for Collair tract and will be given large scale trials in that area next year. Dalwa hybrid cultures 24 and 57 were found equal in yield to Mtu. 9, besides possessing useful characters like non-lodging and non-shedding.

Pure line selection.—There were a very large number of pure line selections under different stages of progress. At Coimbatore 26 cultures of Vellaikar, Vadan Samba and Sirumani underwent field trial tests. The best of them which have consistently given not less than 10 per cent increase over the varieties from which they were selected have been marked for district trials. One hundred and twenty-six cultures of Sannavadlu of Chittoor district underwent the first yield tests and selection work on Manavari of Salem and Coimbatore districts and on Rangoon samba of Erode was commenced during the year. At Aduturai, 380 single plant selections from Manakattai, Mattaikar and Vellaikar of Chingleput district, 120 from Poon samba and 99 from Vadakathi samba of Musiri taluk, were grown as single plant cultures for study and further selection. About 400 of these selections will be carried forward for further study next year. At Ambasamudram over 2,500 single plant selections were studied and the promising of them have been retained for further tests. At Pattambi about 3,500 pure line cultures, isolated from half a dozen local important varieties were tested and the best of them will be carried forward. At Maruteru about 5,000 single plants have been selected from Pedda Atragada, Kusuma and Prayaga and 66 cultures of Swarnalu and Kasara underwent first yield trials. At Buchireddipalem 116 cultures of Molagolukulu, 47 of Atragada were under yield tests and the promising of them will be further tested. A large number of single plant selections from Molagolukulu, Adt. 11 and Pishanam were under observation. Further selections have been made out of them for further study. At Samalkota two selections K. 238/1 and K. 238/2 from Konamani and two selections PA. 44/2 and PA. 117/3 from Punasa Akkulu have given significantly higher yields than their controls for the second time successively. At Anakapalle 84 progenies of single plant selections from two important local varieties were under study and the promising of them have been retained for further tests.

Hybridization.—The method of single plant selection has now been exploited to such an extent in certain parts of the province that no considerable progress can be expected by this method hereafter in these areas. This method has its limitations as no characters which are absent in a plant can be introduced into it

from outside. By hybridization it is possible to combine in a plant the desirable characters of two or more parents and this method is particularly useful in breeding types with combinations of economic characters and resistance to diseases. Increasing attention is therefore now paid to the improvement of crops, particularly paddy and cotton, by hybridization.

At Coimbatore a large number of selections was made from a cross between Co. 4 (highly resistant to blast) and Korangu Samba and carried over by the Svalof method. Three hundred and twenty-six secondary selections from a blast resistant group obtained from a cross between G.E.B. 24 and Korangu samba and 273 selections from a cross between Co. 3 and a Burma type were studied for size of grain and flowering. Desirable selections have been made from each of the above groups for preliminary yield trials. At Pattambi, F-3 and F-4 generations of three sets of crosses between Coimbatore and local varieties were examined, the object being to produce a strain suitable for the tract with the qualities of disease resistance and longer period of seed vitality. At Maruteru 40 cultures were under yield trials and the promising 12 of them have been carried forward for further tests.

Economic mutants from X-rayed progenies.—The four dwarf mutants mentioned in last year's report were again tested this year with different doses of nitrogen as manure. Contrary to the expectation they all lodged in heavily manured plots and gave more or less the same yield of grain as G.E.B. 24. They, however, gave more straw. In unmanured plots one of these mutants gave significantly higher yields than G.E.B. 24. Another set of 10 cultures from X-ray progenies were under yield tests for the first time this year. Six of them yielded 10 to 20 per cent higher than G.E.B. 24.

Cultural experiments.—At Coimbatore in an experiment to find out the effect of graded seed on yield, it was observed again for the third time in succession that there was no difference between heavy and ungraded seeds though seed graded as heavy gave higher yield than light seed. From these results it is evident that beyond cleaning and proper winnowing, no other processing is necessary. In spacing experiments no difference in yield was observed between close and wide planting by increasing the number of seedlings per hole. In wide spacing it was, however, noticed that with the increase in the number of seedlings per hole, the crop put on more uniform growth, flowered earlier and gave an appreciable increase of straw as compared with single planting. At Pattambi, on the other hand, wide spacing gave better yields than close spacing though the increase in the number of plants per hole had no effect. Experiments on transplanting against broadcasting have shown that in Malabar broadcasting with the first heavy summer showers is definitely more profitable than

transplanting while late broadcasting yields less than transplanting. In the case of second crop in the West Coast the age of seedlings up to 60 days had no effect on yield provided they were transplanted in normal season. Transplanting late in the season the seedlings of 50 to 60 days definitely depresses the yield.

Manurial experiments.—At Coimbatore no advantage was found by the application of Ammonium sulphate in more than one dose when the total quantity applied was small but when the quantity exceeded 40 lb. nitrogen per acre it was profitable to apply it in doses of not less than 10 lb. of nitrogen per acre during the period of growth. The application of superphosphate at the time of planting with a basal dressing of green leaf gave significantly higher yield than when it was applied some days after planting. At Maruteru, however, superphosphate had no effect.

At Anakapalle green manure alone (sunn hemp) at the rate of 3,000 lb. per acre gave an increase of 13 per cent of grain and 22 per cent straw over no manure. The increase in yield went up to nearly 57 per cent when the quantity of green manure was raised to 8,000 lb. per acre but phosphoric acid either in the form of bonemeal or superphosphate had no effect when it was applied alone or with green leaf.

At Aduturai in experiments with Ammonium sulphate and superphosphate without basal dressings of organic manures, the combination of nitrogen at 30 lb. and phosphoric acid at 20 lb. per acre in the kuruvai season and nitrogen alone at 30 lb. and nitrogen at 20 lb. and phosphoric acid at 30 lb. per acre in Thaladi season gave best results. Green leaf alone at 4,000 lb. per acre gave significantly higher yields than all other doses of green leaf in combination with bone-meal.

At Pattambi a basal dressing of groundnut cake or green leaf supplemented by Ammonium sulphate gave increased yields. Also green leaf alone or supplemented with Ammonium sulphate was found economically sound.

Application of manures, particularly organic manures, contributed to an increase in the thickness of the aleurone layer of the rice grain making it thus more nutritious.

Electro-culture.—At Coimbatore and Aduturai no effect was perceptible both in the first and second crops. Similar results were also obtained at Maruteru except that the 100 plants along the wire line which were individually sparked gave a 5 per cent increase.

(2) *Millets.*

15. *Millets.*—(i) *Jonna or Cholam (Andropogan Sorghum)—Single plant selections.*—At Coimbatore 1,710 unit selections were sown and studied. During summer 1938, only one strain of Chinnamanjal Cholam, A.S. 3827, proved significantly superior to the standard, A.S. 809. In the main or rainfed season the

same year, the crop remained poor and uneven due to low rainfall and the results obtained from yield tests were therefore unreliable. In summer 1939 water in wells went down so low that they could not irrigate any large areas. Only the new seed collected in summer 1938 was sown for picking the best earheads for preliminary yield trials next year.

At Hagari, seven new selections gave significantly higher yields of grain than T.1 but in yield of straw T.1 was superior to four of these selections. Eight short duration types of sorghum obtained from Mohal (Bombay) were also compared with T.1. As in last year, they all gave significantly higher grain yields than T.1 but T.1 yielded more straw than any of them. One of these strains, M. 47-3 is proposed to be tested next year in districts. At Nandyal promising results were obtained in preliminary yield tests from two strains No. 543 and N. 28/3. In comparative tests none of the new strains did better than the local this year but taking the results of the past three years, two strains, Nos. 294 and 628 appear to have some future.

At Guntur, four strains of yellow cholam (Pacha Jonna) and two strains of red cholam (Yerra Jonna) were compared for yield against their respective local varieties. Of the former three strains, viz., J. 869, J. 877 and J. 885 and of the latter one, J. 916 gave significantly higher yields than their standards. A large number of single plant selections were under study.

Hybridization.—At Coimbatore, crosses have been obtained between five African and local varieties of cholam and they are being back-crossed for big ear heads and bold grain. The crosses between Periamanjal cholam and African Bongonhils and Bombay Silichigan were found resistant to the attack of striga, a root parasite on cholam plants. These crosses have been back-crossed with Periamanjal cholam for combinations of striga resistance and higher yield.

District trials.—Strain A.S. 1543 in Coimbatore district, A.S. 2095 at Pollachi, A.S. 1575 at Karur and A.S. 389 at Musiri gave significantly higher yields than the local varieties with which they were compared under irrigated conditions in January-May season, 1938. Of the summer cholams (irrigated) in the same year, strain A.S. 809 (Chinnamanjal) in three centres, A.S. 1575 (Vellai) in two centres, and A.S. 2095 (Vellai) in five centres in Coimbatore taluk yielded better than the locals. The last mentioned strain gave increased yields over the locals in 1939 summer season also in Coimbatore, Gobichettipalaiyam and Kulittalai taluks; no reliable results were obtained from the rain-fed strains due to unfavourable season. N. 28/3 gave higher yield than the local in Koilkuntla taluk of Kurnool district. Four new strains in Allagadda taluk of Kurnool district and seven new strains in Pulivendla taluk of Cuddapah district fared better than the locals and to find out one most suitable strain for each of these taluks further tests are necessary.

Fodder cholam.—A mutant from a strain of sweet juicy stalked Pacha (yellow) Jonna has given this year in Coimbatore taluk very heavy yields of green fodder and was found much superior to Periamanjal cholam for fodder crop. In Nandyal tract, No. 314 gave the best yield though it did little better than the local during the past two years.

(ii) *Cumbu—(Sajja)—(Pennisetum typhoideum).*—At Coimbatore, among the irrigated strains, P.T. 704 and P.T. 704 selections from "Jamnagar Giant" variety were found superior in yield to P.T. 499, a Punjab strain. No reliable data were obtained from rain-fed strains due to unfavourable season.

In district trials the results so far obtained show that P.T. 2229 has a future in Coimbatore, Dharapuram, Tiruvannamalai, Polur and Tiruppattur taluks, P.T. 499 in Erode, Dharmapuri and Krishnagiri taluks and P.T. 700 in Avanashi, Gobichettipalaiyam, Bhavani, Erode, Udumalpet, Namakkal, Rasipuram, Tiruchengode, Salem, Dharmapuri and Krishnagiri taluks.

A survey of Cumbu varieties and their distribution was started during the year and finished in nine taluks of Coimbatore district and four taluks of Salem district. Eighty samples of seed of both irrigated and rain-fed varieties have been collected for study and breeding work at Coimbatore.

At Koilpatti, 27 strains were under comparative tests and four of them, 447, 453, 458 and 462 gave better yields than the control.

(iii) *Ragi—(Eleusine coracana).*—At Coimbatore, four strains, E.C. 593, E.C. 3735, E.C. 3736 and E.C. 3476 gave significantly higher yields than the standards with which they were compared. E.C. 593 remained unbeaten in all trials where it was used as the standard for comparison against other new strains. At Hagari, R. 42 proved again superior to all strains, including E.C. 593 in the first set of trials and was narrowly beaten by E.C. 593 in the second set. There were eight other new selections under row yield trials and with the exception of one R. 109 all others were inferior to R. 42. At Anakapalle, under rain-fed conditions E.C. 593 proved once again the best. It also proved its superiority as an irrigated crop in Pyru season by beating, V.Z.M. 33 and V.Z.M. 116. In punasa season, No. 525 and B.A.M. 10 did better than the rest. E.C. 593 was not included in these tests.

In district trials three strains, E.C. 593, E.C. 3517 and E.C. 3735 were tested in Coimbatore, Trichinopoly and North Arcot districts. None of them fared satisfactorily under all conditions, though each of them did better than the other two under the conditions favourable for it. E.C. 593 promises to be very suitable as a rain-fed crop and has already extended even to the Mysore State.

(iv) *Tenai or Korra (Setaria italica).*—At Coimbatore, S.I. 523, evolved from a rain-fed variety proved again this year its decided superiority over all other strains both as a rain-fed crop and an

irrigated crop; only one strain, S.I. 2802 gave a little higher yield of straw as a rain-fed crop. At Hagari, K. 24 gave the highest yield in comparative tests. In one set of row yield trials, K. 89 was found superior to all other selections. In another set, 22 selections did better than the control. In district trials, K. 23, K. 67, K. 68, K. 89, K. 92 and K. 167 were found satisfactory in a number of centres and it is proposed to multiply their seed and distribute it to the cultivators.

(v) *Electro-culture.*—An experiment was started on a well-laid plan as in paddy section to verify the claims put forward in recent years in favour of electro-culture. Cumbu and tenai were the two crops dealt with. The results were entirely disappointing. The experiment will be repeated.

(3) *Potatoes.*

16. The potato improvement work is confined only to the Nanjanad Agricultural Research Station on the Nilgiris where three crops of potato are taken in a year. The average acre yields obtained on the station were 11,375 lb. and 10,825 lb. in the irrigated crop of 1938–39 and 1939–40, respectively, 15,250 lb. in the main crop and 11,420 lb. in the second crop of 1938–39 season. Breeding work was discontinued last year with the closing down of the potato scheme financed by the Imperial Council of Agricultural Research.

A large number of hybrid strains were compared for yield with Great Scot and Beneruchan as standards. Some of them look quite promising and they will be tested further.

Agronomy.—In the permanent manurial plots nitrogen alone was no better than control (no manure). Nitrogen and potash gave better yields than nitrogen alone but were not equal to phosphoric acid alone. Nitrogen *plus* phosphoric acid was better than phosphoric acid alone but nitrogen *plus* potash *plus* phosphoric acid was the best of all combinations. In an experiment to test the effects of different kinds of phosphates with and without lime it was observed that steamed bonemeal was definitely inferior to soluble phosphates while a mixture of mono and tricalcic phosphate compared favourably with concentrated super or dicalcic or precipitated phosphate with similar quantities of phosphoric acid. Lime had beneficial effect on all kinds of phosphates but even in the presence of lime full dose of phosphoric acid was necessary to obtain satisfactory results. Cattle manure gave better results when it was applied in rows than when it was broadcasted. Similar results were obtained when nitrogen was given in the form of a mixture of ammonium sulphate and oil cake than ammonium sulphate alone. In planting trials, the crown half of the tuber gave higher yield than either the lower half or the whole tuber. Potato seed when stored in one layer without being greened but sprouts broken once during the period of storage, gave the best yield.

(4) *Fibres.*

(*a*) Cotton.

17. The practice of growing two generations of cultures in one year, one from September to March at Coimbatore and another from March to September at Srivilliputtur in Tinnevelly district was continued. This reduces the time necessary for evolution of new strains and enables the breeding programme to speed up.

It was generally accepted, not very long ago, that evolution of a strain with combinations of good staple length, high ginning out-turn and heavy yield was almost impossible. The new technique of hybridization and back crossing has dispelled this fear and the lowest staple length now aimed at in the Madras Province is 28 mm. against 25 mm. in the past. It is only a question of time and perseverance to isolate types similar to those of Uganda and of even Egyptian. Attention is now therefore increasingly paid to hybridization and the old method of single plant selection has receded to back ground so far as cotton is concerned.

At Coimbatore, a large number of crosses were made between Co. 2 and foreign varieties and 1,235 cultures of F_2 generations were studied. A good number of plants with good lint length and high ginning percentage have been obtained and they will be studied in the next season. Twenty-seven strains evolved in the Herbaceum Scheme were tested for yield on black cotton soils. Eight of them surpassed the control, K. 1. Some of these were also compared in districts but only one, N. 3-2/13 gave uniformly satisfatory results in all centres.

The local belief that karunganni seed grown at Kovilpatti was best for sowing in the Coimbatore district was tested on the Research Station and found without foundation. K. 1 proved as drought resistant as karunganni and uppam mixture falsifying the notion that it was safer to sow a mixture of karunganni and uppam than sowing uppam alone or karunganni alone as an insurance against bad season.

At Srivilliputtur, nine new strains were compared with Co. 2. Two of them, X 4383 and X 3915, gave distinctly higher yields than Co. 2 besides being earlier by three weeks. Their lint is declared as capable of spinning up to 44's, highest warp count as against 33's of Co. 2 and is valued at Rs. 20 on Co. 2 per candy of 784 lb. The two strains are likely to benefit the cultivator to the extent of Rs. 35 per acre in normal seasons. Arrangements have been made to multiply their seed for distribution.

At Kovilpatti, 210 single-plant selections were under row yield tests and the promising of them have been retained for further study. In final comparative tests, only one strain No. 72 gave higher yield than K. 1 in 1937–38 season while in 1938–39 season, the latter was left unbeaten.

At Hagari, 220 single-plant cultures, including 107 selections from crosses, which had a better ginning percentage and lint length than H. 1 were tested for yield against H. 1 in rows. Eleven of them were significantly better and 19 were poorer than the control. The experience shows that crosses between H. 1 and Jayawant have good lint length and low ginning percentage. Crosses with Russian herbaceum lack vigour besides having small bolls with short coarse staple. Only crosses between H. 1 and 1027 A.L.F. appear to have some future. In final comparative tests, H. 1 remained unbeaten both on the Research Station at Hagari and in district trials at Tadpatri. Cambodia did well at Hagari consistently during the past three years when it was sown in July and August under irrigated conditions. It is more profitable to sow in August as there is an appreciable saving in irrigation.

At Nandyal, 29 out of 61 pure line selections examined looked promising and they are proposed to be studied further. In comparative tests all the new strains gave better yields than the local but none of them could beat N. 14. Strains Nos. 340 and 556 are, however, proposed to be tried extensively in districts where N. 14 does not come up satisfactorily. A number of varieties obtained from outside the Northerns area were also tried and of them only No. 117 of Guntur did better than N. 14. A fair number of crosses between N. 14 and other varieties have been back-crossed to N. 14.

At Guntur, incomparative tests in 1937–38, four strains of local cotton, 1110, 950, 779 and 686 did better than the control X 20. These strains were again compared in 1938–39 Punasa season and 779 proved decidedly superior to all the rest. 779 is proposed to be given district trials in the next season. In Pyru season 1128 recorded higher yield than the other strains compared with. Cambodia cotton has not proved a success and crosses between Cambodia and Uganda types will be tried.

Electro-culture as advocated by Dr. Nehru produced no effect on cotton.

Schemes financed by the Indian Central Cotton Committee.—Of the four schemes mentioned in last year's report, the Herbaceum Scheme was closed in May 1938. In the Pempheres and Physiological Scheme, the entomological and physiological wings were terminated in October 1938 while the botanical part of it continues. The Mungari Cotton Breeding Scheme and the Nadam Cotton Breeding Scheme are in progress. A new breeding scheme for the improvement of Cocanadas has since been sanctioned but owing to the receipt of the Government of India's orders late, it could not be started this year.

(*a*) The Pempheres and Physiological Scheme was started in 1931 with the object of devising suitable measures for the control of Stem Weevil (Pempheres Affinis) and for evolving one or more strains of karunganni cotton resistant to the shedding effect of untimely rains.

The first part of the scheme was studied under three heads, botanical, bio-chemical and entomological. On the botanical side, the progenies of the crosses between Co. 2 (Cambodia) and the South American types, resistant to stem weevil attack were studied intensively at Coimbatore and Srivilliputtur. The object in view has been practically achieved by obtaining one strain at Srivilliputtur and eight strains at Coimbatore which can withstand well the attack of the pest. None of these strains are, however, better yielders than Co. 2 and attempts are now being made to improving the yields of these strains. The bio-chemical studies indicate that the resistance to the attack is in some manner connected with the higher proportions of polysaccharides hydrolysable by B. amylase, which the nine strains mentioned above contained. The entomological investigations show that all exotic cottons in general and Co. 2 in particular are preferred by the insect though the indigenous cottons also contribute to their multiplication. The type of food plays a more important part for the increase of the pest than changes in parasite population or environmental conditions like temperature and humidity.

The physiological part of the scheme has produced a strain which withstands shedding better than K. 1.

(*b*) The Mungari Cotton Breeding Scheme has for its object the isolation of one or more medium staple strains to replace the short stapled inferior Mungari cotton grown on the red and mixed soils of the Ceded districts. It was started last year at Adoni where a piece of land has been leased for the purpose. The yield tests between the imported strains and local varieties showed that X. 4383 evolved at Coimbatore was equal to the control in five centres and distinctly superior in the sixth centre. It gave similar results last year also when the season was almost a failure. If it behaves likewise one more year, it is worthwhile distributing its seed to the cultivators on a small scale to begin with. Strain P. 26-H which gave some hope last year proved disappointing this year of average rainfall.

(*c*) The Madras Nadam Scheme was started in 1933 for the purpose of obtaining an annual strain which could supplant the perennial Nadam cotton in parts of Coimbatore, Salem and Trichinopoly districts, where it serves as a breeding ground for the stem weevil as it does not come under the Pest Act. The total rainfall during the year was normal at Perundurai where the work is in progress but the amount of rain received at the time of growing was so low as all the new strains of annual cotton remained stunted while the Nadam in the adjacent fields did not suffer. This would give an idea of the magnitude of the problem. Ten strains—6 American and 4 Indian—were tested for yield. The Indians proved better than the Americans showing that in years of bad distribution of rainfall they could withstand drought better than the latter. The average yield obtained from the Indian cottons was 290 lb. per acre against 200 lb. from the American strains.

The strains evolved in the Herbaceum scheme were tested in the Coimbatore district along with other strains and they have given good account of themselves.

(*b*) **Sunnhemp.**

Work was continued on sunnhemp with the financial assistance of the Imperial Council of Agricultural Research. Ten important varieties of sunnhemp obtained from Rasipuram, Tiruturaipundi, Bellary, Dummagudem, Bezwada, Samalkot, Rajahmundry, Nellore, Tadepalligudem and Vinukonda were studied for duration and growth of plants and for colour, length and strength of fibre prepared under different methods of retting. The first two varieties came to flower in 2½–3 months after sowing, the next five in 3–3½ months and the rest after three and half months. The highest acre yield of fibre was obtained from the Bellary variety followed in order by the Dummagudem, Tadepalligudem and Samalkot varieties. Rasipuram yielded the lowest but it has the advantage of early maturity and high quality of fibre. Little or no difference was noticed in yield of fibre when the crop was cut at different stages of growth from the time it was about to flower till the pods were mature. Retting the stalks one or two days after harvest gave better results. Retting was quicker in still muddy water, but clear running water gave better quality of fibre. Bleaching powder was found more effective in bleaching the fibre and imparting strength to it than any other chemical tested.

In cultural experiments seed-rate at 50–75 lb. per acre gave best results with regard to quality and quantity of fibre. In manurial trials cattle manure alone at the rate of 5 tons per acre was found more economical than cattle manure supplemented with nitrogen or phosphoric acid. Better results were obtained this year in an attempt to self the sunnhemp flower by stimulating the stigma with camel hair-brush.

(5) *Sugarcane.*

18. At Anakapalle, a large number of varieties of cane received during the past few years from the Imperial Sugarcane Research Station, Coimbatore, were studied this year for their classification into early, mid-season and late maturing types. Of these varieties, Co. 381, Co. 440, Co. 508 and Co. 419 were found to be the best from the point of chemical analysis. Co. 381 gave a sucrose content of 20·65 per cent in the month of February against 18·10 per cent of Co. 440 and Co. 508 in December, and 18·22 per cent of Co. 419 in March. Co. 381 and Co. 508 are thin hardy varieties with good field characters and less susceptible to lodging. They are, however, short-growing and have a tendency to arrowing profusely. Co. 440 deteriorates in sucrose content by about the end of January while Co. 508 showed no signs of deterioration till the end of March. Co. 419 appears to be best suited for the locality in every respect except that it breaks in high winds. Of the other varieties, Co. 312, Co. 421 and Co. 533 have a number of good characters with high yielding capacity.

In the preliminary yield trials of the new varieties that looked promising in the observation plots last year, Co. 527 gave the highest yield of 47 tons per acre followed by Co. 523 and Co. 520 with 44·63 and 43·99 tons respectively. The only other variety which gave above 40 tons was Co. 313.

In regular comparative tests, Co. 419 excelled all other varieties with its average yield of 53·38 tons per acre. The other varieties tested were Co. 421, Co. 411, Co. 213, Co. 508, J. 247, Co. 407, P.O.J. 2878, Co. 313 and Co. 281 and their acre yields were 43·18, 41·97, 41·71, 39·2, 38·61, 35·00, 34·91, 33·53 and 27·54 tons respectively.

Co. 419, Co. 421, Co. 313, Co. 411, J. 247 and P.O.J. 2878 were again tested this year for their behaviour under water-logged conditions when planted in February and May. Co. 419 fared the best in both seasons closely followed by Co. 421; P.O.J. 2878 gave the poorest yields.

Of the different methods tested for preservation of planting material, the local method of planting fresh cane tops gave again the best results. Heap method of covering the setts with trash and keeping them moist by frequent watering was found to be the next best up to thirty days while it showed no superiority over the Kurnool and North-West Provinces methods when the setts were preserved for longer periods.

In wrapping and propping experiments, no appreciable difference in yield was noticed in different methods, though wrapping and propping with bamboos or wire gave slightly better yields. Propped canes did not lodge and gave distinctly purer juice than stooked and clamped canes. Wrapped canes did not crack and were less hard.

Studies on ripeness of cane varieties show that flowering is not an indication of maturity. There was little or no growth after flowering beyond the elongation of floral stalk but from the time of flowering the sucrose content steadily increased for two to three months depending upon the variety before deterioration set in. Non-arrowed canes commenced to deteriorate about a fortnight later than arrowed canes.

At Gudiyattam, a large number of new varieties received from Coimbatore were under observation for various economic characters including the period of maturity. The promising of them will be carried forward for preliminary yield tests next year.

The comparative tests revealed once again the decided superiority of Co. 419 over all other varieties tested under normal local conditions of irrigation and manuring. With fewer irrigations and half the normal quantity of manure, J. 247 gave better yield this year than Co. 213, Co. 243, Co. 281 and Co. 313 though the difference was not significant.

Last year, in ratoon experiments the ratoon crop of Co. 213 and Co. 414 yielded better than the plant crop of the same varieties while the ratoon crop of J. 247 did not give even one-third

yield of the plant crop. The three ratoons have again behaved during their second year almost in the same way as last year. Ratoons matured earlier than plant cane but were more susceptible to pests and diseases.

At Samalkot, there were two sets of comparative trials. In one set, Co. 419 excelled all other varieties with its average acre yield of 59 tons against 42·7 tons of Co. 408, the next best. In the second set in which Co. 419 was not included, Co. 417 gave the highest average yield of 54·5 tons per acre against 50·9 tons of Co. 421.

Co. 421 and Co. 213 were again tested for their drought resistance. They were not irrigated except once at the time of planting. Co. 421 yielded 37 tons per acre while Co. 213 gave 33·4 tons.

In an experiment of deep trench planting against the ordinary local method of shallow bed planting, the crop grown in trenches was found less liable to lodging and required scarcely any propping when the yield was not more than 40 tons per acre. Trench planting gave also higher yield when summer rains were not heavy. Bed planted crop was susceptible to lodging and required propping irrespective of its yield.

The manurial experiments indicate that at Samalkot the economic dose of nitrogen is round about 100 lb. per acre and that the application of all manure in one dose as per local method soon after the outbreak of the south-west monsoon gave as good results as when an equal quantity of the same manure was applied in more than one dose.

At Palur, in comparative tests both in wet and garden lands Co. 419 gave again for the third time in succession the highest yield. It has, however, the disadvantage of snapping in high winds. Co. 363, Co. 402 and Co. 421 gave the next highest yields but Co. 402 is poor in analysis and lodges badly. It will, therefore, be discarded. Co. 281 is comparatively a low yielder but has the good qualities of withstanding water-logging and early ripening. Co. 349 is another promising variety and is likely to spread extensively. Co. 413 yielded fairly satisfactorily and deserves further testing.

(6) *Fruit*.

19. (*a*) *Citrus*.—At Kodur in one of the root stock trials the finally selected budded plants of Kodur Chinee orange on nine different root stocks, viz., Jamberi, Gajanimma, Billikichili, Gabbuchinee, Pummelo, Herale, acid lime and Chinee and the seedlings of the same scion parent were planted out in October 1938 after taking measurements of their stem thickness and height. Jamberi was the most outstanding from seedling to the final planting stage. In respect of the size of the root stems at the time of planting Gajanimma was almost on a par with Jamberi. In the second trial the budlings of acid lime on three root stocks, viz., Jamberi, Gajanimma and acid lime and the seedlings of the same

scion parent were likewise planted at about the same time as the above after recording their girth and height measurements. Here also Jamberi produced largest girth at the time of planting while acid lime root stock produced the least. A third trial was also started at the same time for obtaining indications of the influence of various grades of root stocks on the growth of Chinee orange scion and their later performance by planting out budlings raised on Jamberi and Kichili root stocks of three different grades, viz., big, medium and small with average stem thickness of 1·40 cm., 1·15 cm. and 0·88 cm., respectively, at the time of budding. Measurements of girth and heights of all the plants were recorded at the time of final planting.

In progeny tests of individual tree selections, progenies of 21 individual trees which bear in normal season and of 16 individual trees of off-season bearing have so far been planted for their study.

Six plants of tangelo, 3 of citrange, 2 of sweet orange and 3 of grape fruit varieties recently bred at the Bureau of Plant Industry, United States of America, were obtained and planted in the Citrus variety collection plots.

The root systems of seedlings of eight different root stock varieties, viz., Gabbuchinee, Khatta, Jamberi, Gajanimma, sweet orange, country orange, Pummelo and Kichili and also of a chinee-budded plant on each of these varieties were examined. The ages of root stocks at the time of excavation varied from 34 months and 9 days to 37 months and 3 days and that of scion from 21 months and 7 days to 23 months and 5 days. The conclusions arrived at were—

(i) Sweet orange, unworked seedling as well as root stock or budded plant, produced the smallest growth of height and stem thickness. Gajanimma, Jamberi and Khatta produced the largest weight of top growth.

(ii) Sweet orange, either as unworked seedling or as root stock maintained the same position as mentioned above in respect of the depth, spread, and total weight of roots while Jamberi, Khatta and Gajanimma occupied the premier position in regard to these characters.

(iii) Sweet orange seedling and root stock produced the maximum percentage of fibre in the root system and greater root weight in proportion to the top weight. Pummelo came close to sweet orange but the root stocks of Kichili and Gajanimma produced the least proportion of fibre to the entire root system.

(iv) The budded plants of Jamberi, Gajanimma, sweet orange and country orange had deeper roots and greater length of lateral roots than their seedling plants. Similarly the percentage of fibrous roots in budded plants of

Gabbuchinee, Khatta, Jamberi, Gajanimma and Pummelo was higher than those in their seedling plants. These variations show the directions in which the scion modifies the root system of seedling plants.

(v) Sweet orange was the poorest both as seedling and root stock in regard to the depth and feeding power of root systems but this poor root habit cannot be considered as a great drawback as it appears to be mainly due to the relatively poor top growth during its initial period of life.

(b) *Mango.*—One thousand twenty-four stones of 10 different poly-embryonic varieties were collected from the West Coast and sown in the nursery at Kodur for root stock trials. In an experiment to ascertain the effect of the age of the seedling root stocks on the subsequent growth and precocity of grafts, no significant difference was noticed between the three batches of grafts, the root stocks of which were of the same age but inarched at the ages of 10½ months, 13½ months and 16½ months. Following the success obtained in 1937 from root grafting trials, a large number of mango seedlings were raised in 1938 from a mono-embryonic parent with a view to continue the studies on this subject. When these seedlings were 5 months old they were lifted out of ground with naked roots and transplanted in pots. Of these only 5 per cent died soon after potting and 9 per cent suffered to a varying degree. From this it is once again clear that mango seedlings can be lifted successfully with naked roots in commercial nursery practices. A large number of other mango seedlings raised from the same parent was potted without exposing the roots, for trial with double-worked plants. Eighty-four of these seedlings were stem inarched to Neelam and Bangalora scion varieties in equal numbers. The successful ones will be double-worked to two varieties. A separate batch of 600 seedlings of the same parent and age was planted in fresh nursery beds for budding and cleft grafting trials next year.

Detailed morphological descriptions of 258 trees of 156 varieties and of 374 typical fruit specimens of 306 varieties with natural size sketches have been so far recorded. It now remains to put these observations together for working out a system of nomenclature and classification of South Indian mango varieties.

Thirty-three apparently different varieties of grape-vine, 14 varieties of pomegranate, 11 varieties of guava, 7 varieties of figs, 2 varieties of star-apple, 3 varieties of loquats, were obtained from various parts of India and planted in the miscellaneous variety collection plots.

A preliminary trial to determine a suitable method of tapping papaya fruits for the collection of crude papain indicates that mornings and evenings are the best for tapping and the optimum interval between two successive tappings is 4—5 days. Tapping

seems to accelerate the ripening of fruit. Drying of papain in the open appears to be better than drying in the shade from the point of quality and also time taken. 305·68 grams of papain were collected during the year.

Work on fruit products was continued on a small scale.

At Coimbatore, the Assistant in Systematic Botany made a survey of the bananas of the Chittoor and Chingleput districts. Twenty-four local names of varieties from Chittoor district and 22 from Chingleput district were found related to the standard varietal nomenclature fixed for the bananas of the province. Morphological studies on banana varieties were continued. One new variety was added to the banana collection.

At Coonoor, 54 fruit plants received from the Cape of Good Hope were planted and about 500 fruit trees of all kinds which were poor bearers were removed to make room for better varieties. The total yield of fruits of all varieties during the 15 months under report amounted to 11,390 lb. against 8,072 lb. for 12 months previous year. Over 750 plants of plum, prune, peach, orange, grape fruit, apple and pear were successfully budded, grafted or inarched and over 1,000 seedlings and 250 rooted cuttings of various kinds of fruits were raised.

At Burliar a number of unthrifty and useless trees was removed to give sufficient room for the remaining trees. Seven thousand six hundred and fifty pounds of fruits and 78¾ lb. spices were harvested and sold. Mangosteen trees have begun to yield and the crop of Durian, orange and jack fruit was satisfactory. Special attention was paid this year to raising clove plants to meet the increasing demand for them.

At Kallar a fair number of fruit trees was uprooted to provide proper spacing between the remaining trees. This resulted in better yield of oranges in particular. Thirty-nine young mangosteen trees gave a fair yield and 90 per cent of them flowered again in June last. Other fruit trees are in a healthy condition and gave normal yields. Over 2,400 seedlings, 302 economic plants, 3,000 cuttings and 23 fruit grafts were sold during the year.

At Anakapalle various varieties of citrus, mango, fig, lichy and pine-apple plants were received and planted and reputed citrus varieties growing in Vizagapatam and Godavari districts were located and marked for propagation. Root stock trials for Batavian and Vadlapudi oranges were commenced. Thirteen thousand six hundred and fifty-five seeds of different varieties of citrus and mangoes were sown and over 5,000 of them were transplanted for budding.

At Guntur the northern block of the orchard area was properly laid out and planted with fruit plants according to the plan. The work in the southern block was confined to the removal of boulders, levelling the land and laying out irrigation channels.

At Taliparamba, 1,001 fruits of Mauritius and 994 fruits of Kew varieties of pine-apple were obtained during the year. The fruits harvested in hot weather were sweeter, though smaller, than the fruits harvested in cold weather. Mango trees are still too young and only 92 of them flowered this year and gave 1,567 fruits in all. In the nursery a large number of mango and citrus seedlings were raised and about 1,500 older mango seedlings were potted for grafting. Two thousand mango grafts and 1,500 citrus and other seedlings were sold for Rs. 600.

(7) *Oil-seeds.*

20. As in previous years research work on groundnut, gingelly, castor, coconut and cashewnut was continued with the triple object of higher yield, better quality and reduction in cost of production. The Imperial Council of Agricultural Research continued to finance the work on groundnut and coconut.

(*a*) *Groundnut.*—The demand for improved types, viz., A.H. 25 (spreading variety), A.H. 32 (bunch variety) and A.H. 45 (erect variety) was on the increase and every attempt was made to meet the demand by an arrangement with the cultivators. A.H. 25 gives an increase of more than 20 per cent over the locals in most districts but it has not become as popular as it was expected owing to its slightly lower shelling outturn. Attempts are being made to rectify this defect.

(i) *Pure line selections.*—At Tindivanam, six bunch strains and fifteen spreading strains were under comparative trials. Of the former, A.H. 218 which gave consistently higher yield than the control did not fare much better this year than the latter. This may be due to the adverse seasonal conditions. Two other strains did better in yield trials but they suffer from the defect of lower shelling outturn. Of the spreading strains, eight were on a par with A.H. 25 and 25 per cent better than the local. Some of them gave also 5—6 per cent higher shelling outturn and compared favourably with the local in this respect. A.H. 678, which gave a very good increase last year over the local, could not maintain its superiority due to an initial set back of unsatisfactory germination. Of the 20 selections under preliminary tests, A.H. 334 gave a significant increase of 13·3 per cent over A.H. 25. This selection seems to be particularly suited to tracts with deficient rainfall.

Over 300 selections isolated from foreign and indigenous varieties of groundnut were under row yield tests and 33 of them have been selected for further study. Another set of 1,254 selections were made for drought and disease resistance, high yield, thin shell, dormant seed and shorter duration.

(ii) *Hybridization.*—F_2, F and F_4 progenies of crosses between bunch and spreading varieties were studied for selection of types combining as many economic characters as possible. A

total of 227 single plants have been selected out of them. F_1 progenies of 24 crosses were examined and back crosses were made in all the crosses.

(iii) *Effect of climate and soil on groundnut.*—Four pure strains were tried at 27 Agricultural Research Stations in various provinces and States with a view to study their behaviour under different climatic and soil conditions. They gave very high yields up to 126·8 per cent increase over the local in some stations. Their shelling percentage varied from 61·3 to 78 and oil percentage from 40·11 to 55·52.

(iv) *Free fatty acid in commercial groundnuts under normal storage.*—An enquiry into this question reveals that the rate of development of free fatty acid is the least in the "whole" kernel followed by "splits" and "immatures" while the nooks and the "damaged" kernels deteriorate rapidly. The free fatty acid content in the "damaged" group went up in some cases to nearly 30 per cent whereas the percentage usually allowed by foreign purchasers for a normal sample is only 2·5. Any increase over this limit entails proportionate deduction in prices at foreign markets.

(b) *Gingelly.*—(i) Mass selection S.I. 89 gave an increase of 24·2 per cent over local in 1938 summer. In 1939 it was beaten by a new mass selection S.I. 885. S.I. 89 has been issued to the cultivators.

(ii) *Single plant selections.*—Thirty selections were under preliminary yield tests during 1938. Eight of these selections which gave high yields and high percentage of oil were again tested in 1939 and the most promising of them, No. 32–12–14–1 has been selected for further tests.

(iii) *Hybridization.*—Fifteen cyclic crosses between six economic types were effected with a view to build up combinations for selection of suitable strains.

(c) *Castor.*—(i) Forty selections isolated last year from district varieties were studied for their purity and yield. Six of them—two from a Thana variety and four from a Surat variety—were found to be quite promising from the point of yield and duration. In comparative trials no definite results were obtained.

Seeds of the six horticultural types evolved last year were multiplied for distribution.

(ii) *Hybridization.*—Studies of F_1 progenies of two crosses for the inheritance of smooth, warty and spiny nature of capsules, indicate that spininess is dominant over smoothness while warty condition appears only partially dominant over smoothness.

(d) *Coconut*—(i) *Breeding.*—Three F_1 trees of a cross between the common tall variety that flowers in eight years after planting and the dwarf variety that flowers in 3—3½ years started flowering in December 1938 after about four and a half years

growth. The general appearance of the inflorescences is more after the tall parent. These crosses are being studied in detail for their economic value. A total of 106 F_1 seedlings of crosses between tall and dwarf parents with high female flower production, high setting percentage, thick kernel, etc., were planted during the year for the purpose of study.

(ii) An experiment was started to find out the quality and quantity of coir and copra from nuts of different maturity. The results indicate that copra of 9—10 months old nuts is poorer in quality and quantity than that of 11—12 months old nuts. It was, however, found that the oil content of the former was 1—2 per cent more than that of older copra. Coir obtained from these nuts is under study.

Seedlings from early germinated nuts of the same parent tree are found superior to those obtained from later germinated nuts. There are also greater casualties among the seedlings from nuts germinated late. Nuts harvested from February to May are the best from the point of early germination, total germination and vigour of seedlings. Seed nuts could be stored in sand for about nine months without impairing their germinating capacity.

The investigation into the causes of "button shedding" shows that artificial pollination did neither increase nor decrease the setting percentage of female flowers. The retention of one inflorescence by the removal of older bunches and younger inflorescences in the same tree gave conflicting results. Further investigations in this direction are in progress.

A new set of manurial experiments was started this year to determine the most economic dose of ammonium sulphate. The different doses applied were 20 lb. of ash alone, 20 lb. ash *plus* 1½ lb. ammonium sulphate, 20 lb. ash *plus* 3 lb. ammonium sulphate, 20 lb. ash *plus* 4½ lb. ammonium sulphate and 1½ lb. potassium sulphate *plus* 3 lb. ammonium sulphate per tree. Results will be available only in one or two years.

An experiment was started in 1937 at Kasaragod, Nileshwar and Pilicode to study the effect of coconut husks and leaves on the condition of trees and their yields when they were buried in trenches between the rows of trees. The trees in treated blocks look healthier and retain leaves in crowns longer than those in untreated plots. Yield data are not yet available.

(e) *Cashewnuts.*—The cashewnut trees at Nileshwar were applied cattle manure at 20 lb., ammonium sulphate at 2 lb., bone-meal at 1 lb., and potassium sulphate at ½ lb. per tree. The trees have since considerably improved and yielded 1,020 lb. of nuts. Seeds from healthy and high yielding trees were selected for distribution outside West Coast districts.

(f) *Electro-culture.*—Jacketing, sparking of trees, aproning and sparking of inflorescence, soaking of seed coconuts in sparked

water, irrigating with agaskarised water, etc., with suitable controls were started on the coconut stations on the West Coast. No effect due to treatments has so far been observed.

(8) *Spices, condiments and narcotics.*

21. *Chillies* (*Capsicum annuum*).—Breeding by single plant selection method has not so far produced any suitable strains resistant to the attack of an insect known as thrip combined with usual economic characters. The three strains, 363, 390 and 398 which gave at the Guntur Agricultural Research Station consistently higher yields than the local variety failed to give similar results in district trials. Arrangements have been made for a wide collection of improved types and unselected bulks from other provinces like Bombay, Central Provinces, Bihar, Orissa and Bengal and also from various chilli-growing areas of this province. It is hoped that this collection would offer greater scope for selection and hybridization.

From the large number of selections examined last year for resistance to thrips and for other economic characters like yield, colour, shape, size, etc., of the fruit, 158 plants conforming to the minimum standard aimed at have been selected for further studies.

Pepper.—At Taliparamba the manurial experiment once again confirmed the previous results that the application of lime, nitrogen and phosphoric acid would increase the yield of pepper. It has also been proved that pepper crop responds very satisfactorily to better cultivation.

Ginger.—In varietal tests at Taliparamba, Trinidad Canton failed to maintain the position which it occupied last year and gave the poorest yield. Ernad, which gave the lowest yield last year gave the highest yield this year. The Bengal variety did a little better than last year.

Tobacco.—The two cigarette tobacco strains, H.S. 8 and H.S. 9, released from the Guntur Agricultural Research Station have now spread over about a lakh of acres in Guntur district and parts of Kistna district, and about 3,000 lb. of seed of the two types, enough to cover about 8,000 acres were distributed during the year. Fresh selections made this year from the cultivators' bulk crop, hybrid progenies and seed multiplication plots, for earliness, freedom from mosaic disease and yield, size and colour of leaf were examined this year and 35 of them have been retained for further tests. Of cigar types, two new strains, Broad and No. 20 have passed the stage of yield trials on the Research Station and will be tested next year in districts.

Manurial treatment of Virginia tobacco is yet to be solved in the Guntur district in relation to its colour. A large number of soil samples from representative areas producing cigarette tobacco have been sent to the Government Agricultural Chemist for detailed analysis prior to designing a suitable manurial experiment.

(9) *Miscellaneous crops.*

22. *Redgram* (*Cajanus indicus*).—A large number of cultures was tested in progeny rows and the promising of them have been retained for further tests. In preliminary yield tests 25 cultures out-yielded the control. In comparative trials on bigger plots some of the strains have given an increase up to 62 per cent over the control and they will be tested again.

Cowpea (*Vigna catiang*).—Five hundred and fifty unit selections including a number of African varieties were sown for yield trials and for study of the inheritance of characters. No reliable results were obtained as a result of unfavourable season.

Garden pea (*Avari*).—Out of the 120 samples collected, 40 were sown and the best 10 of these have been selected from the point of yield, texture and taste of tender pods for further tests.

D.—Plant Pathology.

23. One way of combating pests and diseases is to breed new strains of crops resistant to them as in the case of stem-weevil on Cambodia cotton and rust on paddy, as already mentioned in the report. Multiplying natural enemies in large numbers and liberating them is another way of dealing with pests but no tangible results have so far been obtained by this method. The usual way of tackling pests and diseases is to make a thorough study of their life history and find out suitable measures to bring them under control. This is the line of attack to which special attention is being paid by the Government Entomologist and the Government Mycologist. On closing down the entomological part of Pempheres and Physiological Scheme, mentioned in item (*a*) under schemes financed by the Indian Central Cotton Committee under (4) Fibre crops, studies were continued on wingless spathius and Braconids, two of the parasites on cotton stem-borer. Studies on boll-worm parasites have again shown that caterpillars of boll-worm (Earias fabia) are attacked in cotton buds and bolls under field conditions by Microbracon lefroyi. The habits and life history of sugarcane moth borer (Diatrsea Venosata) and the extent of damage done by it to sugarcane were studied and the percentage of its attack on six varieties of sugarcane grown in the Central Farm, Coimbatore, was noted. There was little difference in their resistance to the attack of the sugarcane moth borer. Tetrastichus ayyari was for the first time noted as a pupal parasite of sugarcane moth borer and its habits studied. Other parasites of borers which received attention included Apanteles flaripes and Rhaconotus Sp. Studies on ber fruit flies (Dacus correctus and Carpomyia Vesuviana), indicate that the practical way of attacking them is to rake the soil underneath the trees to expose the pupæ and to spray the trees with poisoned molasses. Groundnut surul (Stomopteryx nerteria) was found to live up to 35 days and to die in 4 days if food was withheld. Light traps were effective to attract the adult moths. Considerable reduction in the caterpillar pest of tobacco nursery (Laphygma exigna) was noticed

when ragi was grown as a trap crop. Further studies on green muscardine fungus parasite on coconut beetle grubs have shown that the fungus remains for eight months undestroyed in dung heaps where the grubs live till they become adults and that when the surface layer of dung gets dry, small quantities of fresh dung added to the heaps would attract the beetles for egg-laying. Even mature grubs are affected by the fungus within 20 days. Dusting with sulphur was found effective against the jasmine mite (Eriophyes sp.) which reduces the output of jasmine flowers. The results obtained from an inquiry into the insect pests of stored grains indicate that the best way of preserving seed grain is by driving it in the sun once a month. Lime *plus* creosote, Paracide and Acorns have also given some encouraging results. Pyrethrum powder, Derris powder, dried neem leaves, pungam leaves, tulasi leaves, and talc powder had no effect. A large variety of insects was subjected to electro-culture treatment with disappointing results.

As regards the investigations of fungus diseases, a large number of paddy strains were studied for their relative resistance to paddy blast disease (piricularia) under field conditions at Coimbatore. The results show Adt. 6 is most resistant. Co. 4 and Co. 11 were fairly resistant while all the rest were highly susceptible. September planting gave the highest infection while later plantings suffered less. The disease was found alive up to 13 months in pulvarised paddy soil and pulvarised farm-yard manure. Life histories of two species Helminthosporium (H. tetramera and H. oryhac) isolated from paddy were studied in detail. In a comparative study of H. tetramera, H. nodulosum and H. sativum each of them gave the highest percentage of infection only in the case of the host from which it was isolated, though other hosts were not completely immune. Cholam seedlings remained unaffected by any of the three strains. The ragi strain was able to infect ragi and wheat seedlings and similarly the wheat strain was found to infect wheat and ragi. H. tetramera failed to infect ragi and wheat seedlings but ragi and wheat Helminthosporiums infected barley, oats, tenai and maize seedlings. Comparative studies were continued on areca, palmyra, citrus and tobacco phytophthoras with reference to optimum temperature and humidity, utilization of starch and sugars, growth in different sources of nitrogen, cross inoculations, etc., and interesting results have been obtained. Similar studies were conducted also on horsegram wilt (Macrophomima phaseoli). Eleven varieties of sugarcane, P.O.J. 290, P.O.J. 2878, P.O.J. 2725, Co. 213, Co. 281, Co. 290, Co. 413, Co. 419, Co. 421, Vellai and Poovan, were tested for their resistance to redrot infection by inoculating and incubating their setts. The fungus was found to spread equally well through all the setts of all the varieties except Co. 281 where only a very small area at the seat of inoculation was found infected. In another experiment infection passed on rapidly from the sett to the shoot in Vellai while in P.O.J. the disease did not spread to the shoot even after 3½ months. The growth of the fungus was poorest in ammonium sulphate and highest in Asparagin while peptone and

potassium nitrate also gave good growth. It failed to grow in cellulose while it put on best growth in sucrose, glucose coming next. Seedling blight, boll-rot of cotton (Colletorichum indicum) and betel vine wilt were three other diseases that were similarly investigated and interesting results have been obtained. In the case of citrus leaf fall and citrus root-rot, spraying once with 1 per cent Bordeaux mixture at the outbreak of the disease was found effective. Spraying zinc sulphate was quite successful against mottle leaf disease in citrus trees. Specimens of cardamom rhizome rot received from three different localities were found associated with three different fungi, Cephalasporium sp., Phythium complecteus and Rhizoctonia bataticola .

Studies on virus diseases indicate that tobacco mosaic is caused by five different strains, and all of them are transferable to Nicotiana glutinosa. Thirty-six varieties of brinjals were tested for their resistance to brinjal little leaf disease and none of them were found resistant to it. The disease was successfully transmitted to tomato, tobacco, Datura fastucsa, Solanum Xanthocarpum, S. torvum, S. trilobatum, and a wild variety of S. melongina by grafting. A jassid (Entettix phycitis) appears to act as Victor. A leaf curl disease hitherto unnoticed on papaya trees was observed this year on a few papaya plants. It was found transmissible to healthy papaya plant by grafting.

The Entomology section received 468 enquiries, or requests for help from various parts of the Province. They were, as far as possible, attended to in person by members of the section or suitable advice was offered by correspondence. In addition to these enquiries, the Entomological Assistants posted to different circles dealt with a number of requests for advice on pests of various crops. Similar advice was offered by the Mycology section besides examining and fumigating over fifty consignments of plants and seeds received from foreign countries and examining tamarind and certifying it for transport to foreign countries. The section arranged experimental plots in South Kanara for demonstrating the control of Mahali disease on arecanut trees.

Bee-keeping.—The apiary attached to the insectory at Coimbatore maintained on an average 40 colonies throughout the year for research and demonstration. Considerable progress was made in studies on the flight activity of worker bees in response to pasturage and weather conditions and the results for two honey flow seasons and one slack season are being tabulated. Further observations on the bee enemies, the Tenebrionid wax beetle (Platybolium alvearium), the wax moth (Galleria mellonella), and the lesser wax moth (Achroia grisella), show that under South Indian conditions wax moth caterpillars can be easily eliminated from stored combs by exposing the latter to a mild sun, temperature not exceeding 45°C for about 15 minutes. The lesser wax moth was found parasited by a Braconid and did not therefore assume a pest form. The wax beetle was controlled

by cleaning the floor board periodically. Another aspect of study which showed good progress was the artificial granulation of honey. Samples of honey which did not granulate for some months were found to do so when they were subjected to low and ordinary temperatures on alternate days for a period of about 45 days. The effect of requeening the colonies is another item of research attempted during the year. The progress of the requeened and the control colonies is being watched. Studies on extraction and preservation of rock bee-honey were also undertaken. A honey press and honey strainer were devised and their preliminary trials indicate efficiency of the strainer which could drain out 90 per cent of the honey within three hours. A centrifugal extractor has also been designed and it is proposed to test it soon.

E.—Implements.

24. The demand for improved implements, made in India, has been on the increase year after year and the large number of spare parts sold is a sufficient indication that the implements are now in greater use that in the past. The number of ploughs purchased by ryots during the year increased to 6,608 from 5,257 during 1937–38 which was itself a record figure. A welcome feature of the year is the earnest attempt made by a firm in Coimbatore to manufacture iron ploughs and other implements with the co-operation of the Agricultural Research Engineer. Two of their ploughs are now undergoing field trials in various Agricultural Research Stations.

Of the ploughs approved by the Agricultural Department, Cooper No. 11 continued to be most popular, next in demand being the small Cooper No. 25 and Gurjar No. 2. The demand for bigger ploughs is slowly increasing and the new Cooper No. 34 may be said to have completely replaced the Victory plough made by Messrs. Ransomes, Sims and Jefferies of England and considered one of the best of its kind imported from foreign countries. The Bar point ploughs supplied by Messrs. Cooper Engineering Works of Satara are being tested in view of a large number of enquiries received in regard to ploughs of this type. The small size ridge plough, designed by the Agricultural Research Engineer has been gaining popularity and 257 ploughs of this type were sold during the year. Another ridge plough with adjustable wings to make furrows of different widths and a suitable cultivator to replace the foreign makes have also been designed by the Research Engineer and are under final tests. The defects noticed last year in the bullock-drawn basin lister, single furrower, were rectified by altering it into a double furrower to give even draught by avoiding jerky motion during working which was very trying to animals. The implement is under trial in different black soil areas. Further improvements were made in the new mechanical seed drill designed by the Research Engineering Section to make it

cheaper and lighter, consistent with efficiency. It can be used for sowing any kind of seed at any depth and width. Its only defect is that it is a little costly. Further work on green manure trampler has resulted in the production of a simple and light implement useful for incorporating green manure into puddled fields and it can be worked easily by an ordinary pair of work animals. It is likely to become popular in wet land tracts. Considerable attention was paid during the year to the improvement of the design of the wet land puddling implement, by making it lighter in draft and reducing its cost. A few of these implements have already been purchased by the cultivators. The turmeric polisher designed by one of the Agricultural Demonstrators has become popular in the turmeric areas of Coimbatore district. It is stocked in numbers by many co-operative societies and hired by the ryots during the season at 8 annas per day. A number of paddy shelling hand machines were tested with a view to select the best of them which could produce unpolished rice equivalent to hand-pounded rice. The Japanese Ce Co. Co machine was found quite efficient and capable of shelling in a normal day of 8 hours worked by 2 coolies, 8 bags of paddy with almost negligible percentage of breakage of rice. A local engineering firm has produced a hand operated machine on the model of the Japanese machine and it is found to work satisfactorily. Ordinary wooden grinder seems to serve the same purpose but its outturn is small and breakages higher besides the wear on the grinder being considerable. The same local firm in Coimbatore has, on the suggestion of the Research Engineer, produced a winnowing machine similar to Corbett winnowers of English manufacture at a low cost and it has been reported to be working satisfactorily.

F.—Trial Plots.

25. The results obtained at the Agricultural Research Stations are not immediately handed over to the cultivator. They are further tested for a period of about three years under local conditions in districts and are passed on to the cultivator by means of practical demonstrations, only when they proved satisfactory in these tests. The cultivator places a portion of his land at the disposal of the Agricultural Demonstrator on condition that if any additional expenditure was necessary above his usual cost of cultivation, it would be met by Government but no such expenditure is required except under very rare circumstances; the entire yield is taken over by the cultivator unconditionally. There were during the year 1,414 plots in the province for testing the yielding capacity of the new strains of paddy, ragi, sugarcane, cotton, chillies, jonna (cholam), korra (tenai), tobacco, gingelly and groundnut against 1,026 plots in the previous year. These were in addition to the 350 observation plots for noting the general behaviour of certain other new strains of paddy, ragi, jonna, korra, chillies, groundnut, sugarcane and cotton which have not yet completed the yield tests on Research Stations.

Paddy.—Two of the strains, Bam. 2 and 10 obtained from the Berhampur Agricultural Research Station prior to its transfer to Orissa, proved superior in yield to the local paddy by 12 and 10·5 per cent respectively. The Anakapalle strains, B.T. 155, Mypali 7 and G.E.B. 24 gave an increase of 26, 21 and 16 per cent over the locals; Atragada 3156 yielded 9 per cent more than Mtu. 6, a pure strain already under distribution while no such difference was noticed between Atragada 4576 and Mtu. 6. The blast resistant strains were found promising at Nellore. In the Erode taluk of Coimbatore district T. 672, T. 673 and BK. 5109 proved satisfactory while T. 6119 and BK. 5715 gave similar results in Salem and North Arcot districts. The Pattambi strains did well in the Malabar and South Kanara districts.

Cotton.—At Nandigama in Kistna district, the Cocanada strains, X. 20 and 43 yielded 20 and 14 per cent more respectively than the local cotton while strain No. 171 did still better in the Peddapuram taluk of East Godavari district. In Bellary and Anantapur districts, both Mungari (early sown) and Hingari (late sown) strains were found satisfactory and similar results were also obtained from some of the Nandyal strains in Kurnool and Cuddapah districts. In Tinnevelly, Madura and Ramnad districts, two strains of Cambodia, 3915 and 4383 and two strains of Karunganni, 202 and N. 3-2/13 proved promising while another Cambodia strain, 920 gave definitely higher yields than the locals in two of the three localities where it was tested.

Sugarcane.—Co. 419 gave the highest yield practically everywhere it was tested in the whole province and in milling quality it was nearly as good as any other superior cane. Co. 219 in Anantapur district and P.O.J. 2878 in Coimbatore, North Arcot and South Kanara districts gave satisfactory results.

Jonna or Cholam (Sorghum).—In the I circle, strains 103 and 91 gave an increase of 25 and 12 per cent, respectively over the local. In the III circle, A.S. 2095 did better than A.S. 46, A.S. 97, A.S. 1543 and A.S. 1570. Similar results were also obtained from A.S. 2095 in Salem and North Arcot districts. In Coimbatore district, A.S. 1575 proved superior to the local.

Ragi.—E.C. 593 remained unbeaten in Nellore, Salem, Coimbatore and South Arcot districts. E.C. 24 did better than E.C. 3517, E.C. 3735 and E.C. 593 in the III circle, while E.C. 3575 proved very satisfactory in Madura and Ramnad districts.

Cumbu.—In Chingleput district, the giant hybrid and Australian varieties gave 100 per cent more yield than the local. In Tinnevelly, Madura and Ramnad districts, K.P.T. 105 gave the highest yield and K.P.T. 5 was in good demand for its flavour. P.T. 700 and P.T. 2229 were found satisfactory in yield in Coimbatore district.

Korra or Tenai (Setaria italica).—S.I. 523 gave again the highest yield in Coimbatore district while S.I. 554 proved quite promising in Salem and North Arcot districts.

Wheat.—Pusa No. 52 did well in Coonoor taluk while A. 013 and 115 from Central Provinces fared better in Ootacamund taluk of Nilgiris district.

Groundnut.—A.H. 25 gave 15·7 per cent more yield than the local in Vizagapatam district and fared equally well in the IV Circle.

Gingelly.—S.I. 43, S.I. 46 and S.I. 89 were compared with the locals in South Arcot and Tanjore districts and have been reported quite favourably.

Tobacco.—Chewing tobacco was tried in some taluks of Chittoor district with encouraging results.

V.—Demonstration.

26. The various improvements advocated by the department especially in the cultivation of important crops like paddy, cotton, sugarcane, jonna or cholam, ragi, groundnut and tobacco, and methods adopted in controlling various insect pests and plant diseases were, as usual, brought home to the cultivators by practical demonstrations in their own fields and at their own cost. There were during the year 8,740 demonstration plots in the ryots' lands spread over the whole province as against 7,963 in the previous year.

Reference was made in previous years' reports to the intensive propaganda carried on in the Vizagapatam district by a special staff of demonstration maistries. This is the fourth year of the working of the scheme.

The maistries did intensive work in 360 villages while particular improvements such as cultivation of paddy strains, growing green manure crops and their application to paddy, augmenting the supply and quality of farmyard manure and popularization of improved implements were extended to 1,075 villages, bringing the average number of villages which each maistry got into touch with to 20 against 18 of last year.

As in the previous year, the season during the year under report was again unfavourable in majority of the taluks where the scheme has been in operation.

A comparative statement showing the extent of improvements effected in 1938–39 as compared with those of the past 4 years is given below :—

Number and name of improvement.	1934–35.	1935–36.	1936–37.	1937–38.	1938–39.
	ACS.	ACS.	ACS.	ACS.	ACS.
1 Introduction of improved varieties and strains of paddy.	96,313	72,515	97,877	100,240	198,845
2 Early and proper preparation of paddy seed beds.	2,242	2,647	5,763	9,328	9,621
3 Planting thin sown seedlings of paddy.	42,643	29,496	55,969	66,287	97,753

	Number and name of improvement.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
		ACS.	ACS.	ACS.	ACS.	ACS.
	4 Application of green manure or green leaf to paddy.	23,811	4,768	12,687	20,362	29,202
(a)	5 Introduction of Co. 213 sugarcane.	1,534	4,452	6,297	7,218	6,886
	6 Introduction of other improved varieties.	63	195	399	464	1,037
	7 Wider planting of sugarcane in lines.	4,641	3,370	6,814	6,476	7,282
(b)	8 Interculturing sugarcane by bullock power.	381	838	1,826	2,505	2,340
	9 Planting with improved sugarcane seed material.	3,635	5,374	5,898	6,142	8,109
	10 Area under short crop sugarcane.	69	129	44	82	184
		NO.	NO.	NO.	NO.	NO.
(c)	11 Jaggery making demonstrations.	622	805	681	1,046	588
(d)	12 Construction of improved furnaces.	123	465	681	710	426
(e)	13 Supply of iron banded sugarcane mills.	44	292	228	55	10
		ACS.	ACS.	ACS.	ACS.	ACS.
	14 Area under improved Ragi strains.	564	628	1,048	1,443	2,995
	15 Area under improved Ganti varieties.	..	..	165	144	538
(f)	16 Area under graded jonna seed.	30	563	981	1,693	1,000
(g)	17 Treatment of jonna seed against smut.	57	602	658	1,540	819
	18 Groundnut sown in every furrow.	1,343	2,859	7,041	17,376	26,000
(h)	19 Cultivation of plantains on improved lines.	607	555	571	1,125	1,082
(i)	20 Area under fruit trees ..	372	270	329	525	455
		NO.	NO.	NO.	NO.	NO.
	21 Manure pits and heaps properly covered.	4,185	17,115	20,501	30,456	39,402
	22 Conservation of cattle urine by the use of dry earth and litter.	2,250	6,829	10,168	16,822	32,256
	23 Ordinary composts made..	435	454	875	1,594	2,532

(a) With introduction of better varieties like Co. 419, Co. 421, P.O.J. 2878, the area under Co. 213 has fallen slightly.

(b) Heavy showers during the early part of south-west monsoon rendered conditions unsuitable for interculturing cane with bullock power at the right time and later it was not possible as the cane crop grew to great height.

(c) The ryots of the tract were well trained in the art of jaggery making and hence the need for more was not felt.

(d) and (e) The improved furnaces constructed in the previous years were functioning and the number now noted adds to the list. So also in the case with iron banded sugarcane mi.ls.

(f) and (g) The heavy rains of October and November interfered with the normal sowing of jonna crop and hence the area dwindled. So also the extent of jonna crop sown with seed treated against smut.

(h) A large area was kept under ratoon during the year and the desire for larger area under cane estricted the increase under plantalu.

(i) As gardens are perennial in character increase in their extent year after year cannot be expedited.

Number and name of improvement.	1934-35.	1935-36.	1936-37.	1937-38.	1938-39.
	NO.	NO.	NO.	NO.	NO.
(j) 24 Sale of Cooper, Gurjar, Kirloskar and Ridge ploughs.	315	492	546	273	257
	ACS.	ACS.	ACS.	ACS.	ACS.
25 Pests and diseases tackled (excluding smut on cholam).	252	664	1,093	1,583	342
	NO.	NO.	NO.	NO.	NO.
26 Bee-hives maintained ..	2	4	28	61	96
27 Demonstration plots laid.	654	1,582	1,128	1,203	1,363
28 Trial plots laid	76	237	354	223	439
29 Demonstrations made with implements.	1,456	1,466	2,140	3,578	4,014

(j) The number of improved implements supplied already amounted to 3,571 by the end of last year. The present number 257 adds to the number already under usage.

Figures summed up since the introduction of the scheme in May 1935 indicate the extent of improvements effected during the past four years.

The demonstration staff is paying constant attention to the control of common pests and diseases of crops. During the year under report an area of 342 acres was tackled with as against 1,583 of last year. The decrease is due to the absence of rice case worm, which was very bad in previous years.

Due to the transfer of the livestock section to the Veterinary department, the maistries merely attended to the advice in the maintenance and rearing of cattle and poultry.

There is a clear effect of the intensive work initiated in the scheme taluks as evidenced from the gradual rise in the extent of improvements.

Exhibitions and shows.

27. As usual, agricultural exhibitions and shows were held during fairs and festivals, conferences, health week celebrations and jamabandi camps. The number of exhibitions and shows held during the year was 379 as against 352 in the previous year. An annual exhibition lasting about a month from the middle of December 1938 to the middle of January 1939 was held at the Congress House, Madras, under the auspices of the All-India Khadi and Swadeshi Exhibition Committee. Another exhibition lasting over a period of a fortnight from 24th December 1938 to 7th January 1939 was held in the South Indian Athletic Association's grounds in Madras in connexion with Annual Park Fair. In the two exhibitions all the Circle officers and Heads of Research Sections participated by sending useful exhibits and deputing their assistants to explain or demonstrate them. These occasions served a useful purpose for educating both the urban and rural population in the activities of the Agricultural department. The second Cuddapah District Agricultural Exhibition was held during the year

on a large scale and from the surplus funds out of collections, a rubber-tyred bullock exhibition van was purchased for touring in the district.

Two thousand and twelve lectures with and without the aid of lantern were delivered during all exhibitions, jamabandi camps and conferences.

The Motor Exhibition Vans, Unit No. I and Unit No. III, which became unserviceable, were condemned during the year. Unit No. I was sold in auction, and Unit No. III is awaiting sale. The new Touring Motor Exhibition Van of the Veterinary department toured in the II Circle and the Agricultural Demonstrators of that circle toured with the van doing propaganda work on Agricultural improvements. In Tanjore district, the Agricultural Demonstrators toured along with the Tanjore District Board Rural Reconstruction Vans and carried on their propaganda.

Items of propaganda.

(1) Crops.

28. (*a*) *Methods of cultivation*—(1) *Paddy*.—Reduction of seed rate in nurseries and transplanting of seedlings in singles and doubles were the two items of improvement to which attention was mainly devoted in the I Circle. The area under thin nurseries and transplanting extended to 32,102 acres and 359,259 acres as against 28,514 acres and 316,401 acres, respectively, of last year. Early preparation of seed-beds with improved ploughs was also advocated as usual. In the II Circle, the use of suitable iron ploughs, reduction of seed rate by thin sowing and economic planting formed the chief cultural improvement on paddy. In certain parts of the III Circle the old practice of using high seed rate was found still in vogue and an attempt was therefore, made this season (1939) in the Tanjore taluk to educate the ryot population by intensive propaganda to reduce the seed-rate to a minimum. To this end, eight special maistries were employed for practical demonstrations in Kuruvai and Samba nurseries. The total area under economic transplanting of paddy in the whole Presidency is now estimated at 1,327,462 acres.

(2) *Cotton*.—Sowing of Cambodia cotton on flat beds is the common practice in the IV Circle. Attempts were, therefore, made to popularize ridge-sowing and the area sown according to this method amounted to 1,974 acres. The profit derived by the cultivator from this simple improvement was roughly Rs. 4 per acre.

Two crosses (3915 and 4463) have been obtained from Co. 2 and Uganda cottons with the qualities of early maturity, high ginning percentage and finer quality of lint than Co. 2. A beginning was made during the year to multiply the seed of the two varieties for distribution to the cultivators in the place of Co. 2. In the I Circle, Cambodia gave 250–375 lb. of kapas per

acre when it was grown mixed with dry paddy in Razole taluk, while it yielded 1,040 lb. per acre when it was sown in punasa season in Bhadrachalam taluk.

(3) *Sugarcane.*—Improvement in the way of introduction and spread of suitable varieties and improving the standard of sugarcane cultivation on economic lines was continued as before. Other improvements introduced and popularized were the planting of cane in lines with greater spacing between the rows and intercultivation with bullock power. There was considerable increase in area under Co. 213, Co. 419 and Co. 313, the increase being very marked under the first two varieties particularly in localities where sugar factories have sprung up. Varieties like Co. 281, Co. 421 and P.O.J. 2878 remained popular for their early maturity and high sucrose content. In the III Circle, the area under sugarcane has been gradually increasing due to favourable market for jaggery, and the impetus given to sugarcane cultivation by the introduction of hardy canes like Co. 281, Co. 213. Co. 352 and Co. 350. Fiji B remained in great demand by the Sugar factory as Nellikuppam which consumes a major portion of the sugarcane in South Arcot district, and Co. 419, Co. 417, Co. 421 and P.O.J. 2878 are rapidly gaining popularity. With the opening of a new factory at Karur, it is hoped that the area under sugarcane will increase in Trichinopoly district. Other improvements advocated by means of demonstrations were the preparation of trenches with iron ploughs, planting in lines, economising the seed-rate, selection of disease-free setts and better method of preparing jaggery. The total area in the Presidency during the year under the improved methods of cultivation is estimated at 52,636 acres. One thousand one hundred and thirty-seven improved furnaces were constructed during the year for cultivators and 1,584 demonstrations were held on the preparation of superior jaggery besides the 27 demonstrations on cream jaggery. Thirty-nine improved sugarcane mills were supplied to ryots in the I Circle.

(4) *Groundnut.*—In the Vizagapatam district the main improvement advocated on the cultivation of groundnut is the sowing of seed in every furrow instead of sowing in alternate furrows as per local method. The area sown in every line during the year was 44,075 acres as against 17,376 acres in the previous year. A.H. 25 and A.H. 45 (H.G. 1) have become popular in all groundnut growing areas in the Province. They are being multiplied in seed farms and distributed to cultivators.

(5) *Potato.*—The chief items of demonstration were contour planting, proper cultivation and manuring and grading of potatoes

(6) *Fruits.*—Cultivators were given every encouragement to take to fruit cultivation seriously and run the fruit gardens on business lines. They were supplied with fruit plants from the Fruit Research Stations at Kodur, Coonoor and Taliparamba and also from reliable nursery men and advised the methods of planting,

manuring, pruning and spraying against pests and diseases. The advantage of planting cashewnut on the vacant hill slopes and sandy wastes of the West Coast was brought home to the cultivators. The opening of a fruit nursery at Taliparamba during the year has given an impetus to fruit industry in the West Coast.

(b) *Methods of manuring.*—With a view to amplify the supply of bulky organic manures the ryots were advised to grow green manure crops like Dhaincha, Indigo, Sunnhemp, Vempali, Pillipesara and incorporate them in the soils. Demonstrations were also conducted to impress the importance of green manure when it was applied in conjunction with phosphatic manures.

Artificial manures are stocked and sold by the manure firms and the ryots are directed to them for their purchase. The department offers advice on the proper use of fertilizers in combination with organic manures and large quantities of these manures are being used for sugarcane and potato crops. In the Nilgiri district, the advantages of the application of lime were demonstrated on 10·9 acres belonging to 33 ryots in 16 villages.

(c) *Seed distribution*—(1) *Paddy.*—All the seed available from the Agricultural Research Stations was mostly supplied for seed farms. In the I Circle, there were 8,490 acres under seed-farms and the quantity of pure seed distributed to the cultivators amounted to 5,593 tons. The total area covered by the improved strains of paddy in this circle rose to 684,910 acres from 330,969 acres last year. In the II circle, 44,442 acres were under improved strains. In the III circle, the demand for departmental seed is growing year after year and every effort was made during the year to meet it from seed-farms, run both by ryots and the department. In South Arcot district, L.G.S. 43, Adt. 9, Adt. 12 and Kasipichodi continued to be popular. In Tanjore district, the popular strains were Adt. 1, Adt. 2, Adt. 5, Adt. 6 and Adt. 7 for the Samba season and Adt. 3 and Adt. 4 for the Kuruvai season. In Madura division, Adt. 11. G.E.B. 24, Co. 2 and Co. 7 have become popular and in Tinnevelly division Co. 9 for the Kar season and Co. 8 for the Pishanam season, and Co. 2 for late planting are in demand. In the IV circle, nearly sixty strains of paddy were distributed according to localities and seasonal conditions. G.E.B. 24 is found to have spread all over Tiruppattur division. Co. 2 (paddy) is very popular in North Arcot district as a late samba crop, while Co. 5 is popular as an early crop. Co. 3 has spread well as a main samba variety in Salem district. Among Kar varieties, Adt. 3 and 4 are most popular, while Vadan samba selections made at the Palur Agricultural Research Station are gaining favour as semi-dry varieties in North Arcot district. In Coimbatore district, T. 692 and T. 673 which were introduced from Patna in 1936–37 have established themselves replacing Rangoon samba. Short duration strains such as 5109, 5143, Adt. 3 and 14 have been found to be suitable for Coimbatore district. All the Pattambi strains were in great demand in Malabar and South Kanara districts.

The total area under all improved strains in the Presidency including natural spread is estimated at 1,704,399 acres. The total quantity of paddy seed distributed in the Presidency through the departmental agency was 8,247 tons.

(2) *Cotton*—(*a*) *Cambodia cotton.*—The area under Cambodia was limited in the II Circle for want of irrigation facilities but attempts were continued to ascertain the suitability of this cotton for certain parts of Nellore, Chittoor and Chingleput districts. Cambodia has begun to replace groundnut and sugarcane in the January-February season in South Arcot district. In the III Circle, there were 271 acres of Cambodia under the control of the Agricultural department for multiplication of pure seed for distribution to the cultivators. In the IV circle, production and distribution of improved strains of Cambodia were the main items of work in Coimbatore district and the major portion of the area under cotton in this district may be said to be under Co. 2.

When Cambodia Seed Multiplication Scheme financed by the Indian Central Cotton Committee, was brought to a close at Tiruppur in August 1937, the Tiruppur Co-operative Sale Society undertook the work of multiplication and distribution of Co. 2 (Cambodia) seed in Tiruppur area. The Indian Central Cotton Committee financed the society with a grant of Rs. 1,728 towards the pay of a demonstrator and a maistri for a period of one year during 1938–39. The society issued enough seed to cover an area of 5,679 acres for multiplication of seed but owing to unfavourable season and consequent attack of the crop by plant lice from its early stage, the society was unable to obtain more than 2,689 bags of good seed against 13,146 bags obtained in the previous year.

In Salem district, Cambodia occupies nearly 100,000 acres. A seed multiplication scheme similar to the one at Tiruppur was sanctioned by the Indian Central Cotton Committee for a period of five years. But due to good and timely rains the ryots in the Salem district sowed more area under paddy than under cotton and the required extent of the outer seed-farms could not be had. The inner area was, therefore, limited to 450 acres and the outer area was postponed for a year or two.

The total quantity of improved Cambodia seed distributed to the cultivators during the year was 276,089 lb. The total area covered by the improved strains in the whole province was 216,282 acres against 246,367 acres in the previous year, the decrease being mainly due to famine conditions in the Coimbatore district.

(*b*) *Karunganni cotton.*—This cotton is confined only to the III and IV Circles. An area of 1,951 acres was under seed-farms and 155,192 lb. of pure seed of K. 1 and C. 7, the two strains recommended by the Agricultural department, were distributed during the year. The area under the two strains is estimated at 162,971 acres.

(*c*) *Westerns cotton.*—It is confined to Bellary, Anantapur and portions of Cuddapah district, and H. 1 is the strain under distribution. Seed farms to the extent of 4,600 acres were sown with H. 1 to meet the increasing demand for pure seed. In Bellary, the seed-farm lint fetched a premium of Rs. 4–14–0 per bale while in Cuddapah the premium paid per bale was Rs. 7–10–0. It is calculated that every acre under this improved strain brings an extra profit of Re. 0–12–0 per acre in Bellary and Anantapur districts, and Rs. 2–8–0 per acre in Cuddapah and Kurnool districts. The total area sown to this cotton was 248,954 acres as against 222,843 acres in the previous year.

(*d*) *Northerns cotton.*—This cotton is grown mainly in the Nandyal tract of Kurnool district. The strain under distribution is N. 14, and 100,204 lb. of seed was issued during the year. The total area sown is estimated at 10,160 acres as against 4,368 acres in the previous year. N. 14 lint was sold at a premium of Rs. 24–8–0 per candy of 500 lb. over the local to Messrs. Binny & Co. The reason why it has not become as popular as H. 1 is that it has low-ginning percentage.

(3) *Sugarcane.*—In the I Circle, an area of 217 acres was short cropped for multiplication and supply of vigorous seed material and good seed cane sufficient for 871 acres was thus made available. There was a good demand for Co. 213 and Co. 419 in the localities served by sugar factories and their area increased during the year to 10,560 acres and 1,121 acres from 7,522 acres and 32 acres last year, respectively. Co. 313 came next in demand and Co. 243 was almost exclusively confined to the Vuyyur tract. Other varieties grown were Co. 281, Co. 421 and P.O.J. 2878 which were preferred in some localities for their early maturity and high sucrose content. In the II Circle, Hospet taluk was for the first time declared a controlled area under the Sugarcane Act of 1934 with effect from 6th December 1938. The minimum price fixed for cane varied from Rs. 8–8–0 to Rs. 9–8–0 per ton. But the Sugar factory at Hospet failed to come to an understanding with the cultivators of the Hospet taluk and preferred to purchase cane from the Hyderabad State even at Rs. 12 per ton, delivery at the factory rather than paying more than Rs. 10 per ton for local cane of the same or even better quality. The factory, however, came round offering Rs. 12 per ton at the close of the season but it was too late. The net result was that in spite of a longer crushing season this year the factory could not crush more than 33,900 tons of cane and that the cultivators had to take to jaggery making. The only benefit derived by the cultivators from the enforcement of minimum prices was that the contracts which they had entered into with the factory at lower rates became null and void. Of the several new varieties recently introduced at Hospet, Co. 419 has given the highest yield and is likely to become popular soon in the whole Hospet taluk. It has done equally well in Chittoor and Chingleput districts while Co. 219 seems to have better

future in Anantapur district. In the III Cirlcle, the introduction of thin canes like Co. 281, Co. 213, Co. 352 and Co. 353 has given greater impetus to cane cultivation. Fiji B remains popular both for sugar and jaggery manufacture and this variety and Co. 281 have completely replaced the local cane in Karur and Kallakurichi areas. In the IV Circle, thick varieties like Co. 413, 419 and 421 have practically replaced all the local varieties such as Mauritius, Poovan, Vellai and striped canes in Coimbatore district and the demand for improved varieties of cane in this district was so great that the cultivators were prepared to pay even fancy prices for their setts. Co. 419 was the most popular variety in Tiruppattur division. The total number of setts distributed during the year in the province was 21,203,512. The total area under new varieties increased to 54,515½ acres from 46,064 acres in the previous year.

(4) *Jonna* (*Sorghum*).—Jonna is the most important staple food crop of the Dry districts of the II Circle. T. 1 Jonna (white) continues to be popular in the Bellary district and N. 28/68 (yellow) is coming into favour in the Kurnool and Cuddapah districts. The total area covered by the two strains in the four Ceded districts was 216,629 acres as against 30,430 acres last year. The demand for seed was met by arranging seed farms. In the IV Circle, A.S. 1575 was found superior to local cholam as an irrigated crop in Coimbatore district. A.S. 1098 failed to set seed in North Arcot district but compared favourably with the local varieties in Salem district. A.S. 2095 is another strain which appears to have some future in both districts. The total quantity of seed distributed in the Presidency was 40,039 lb. as against 22,145 lb. during the last year.

(5) *Ragi*.—This is one of the important crops in the Vizagapatam district and is grown there in all the three seasons. The two strains evolved at the Agricultural Research Station, Anakapalle, viz., Nos. 525 and 535 are becoming popular in the district and occupied an area of 4,175 acres this year against 1,421 acres in the previous year. In the II Circle, E.C. 593 is slowly gaining ground in Anantapur, Kurnool, Chingleput and Nellore districts. E.C. 3570, E.C. 3735 and E.C. 3030 were also tried with success in Nellore and Chingleput districts. In the III Circle, E.C. 3735 proved to be the best in Madura division. In the IV Circle, E.C. 593 is gaining popularity and H. 22 of Mysore has done well as a dry crop in Salem district. The total area under improved strains in the whole province was estimated at 19,816 acres against 7,532 acres of last year and the total quantity of seed distributed was 24,954 lb.

(6) *Groundnut*.—In the I Circle, the two new strains A.H. 25 and A.H. 45 (H.G. 1) occupied an area of 6,568 acres. In the II Circle, A.H. 25 is gaining ground in the red soil areas of Bellary and Anantapur districts and also in certain parts of

Cuddapah, Kurnool and Chingleput districts. A.H. 45 (H.G. 1) is the next popular variety in Chingleput district where it is grown both as an irrigated and unirrigated crop. In the III Circle, two-thirds of the area under groundnut was sown with A.H. 25. In the IV Circle, the seasonal conditions were so unfavourable as the groundnut crop was a total failure in many localities.

A.H. 25 would have spread more rapidly but for the fact that the relative percentage of kernels to pods as compared with local Mauritius is slightly low and therefore a lower price is offered for it. It is, however, gaining ground wherever bunch variety is grown. A total quantity of 60,094 lb. of seed of all improved varieties was distributed during the year throughout the Presidency.

(7) *Tobacco.*—The cultivation of cigarette tobacco "Harrison special" made much headway in Guntur and in parts of Kistna and West Godavari districts where it covered nearly a lakh of acres during the year. H.S. Nos. 8 and 9 remained popular and 300 lb. of seed of the two varieties were distributed to the ryots; the total area covered by the two strains was 7,788 acres. In the II Circle, Virginia tobacco was grown on 222 acres in the Kandukur taluk of Nellore district and chewing tobacco was tried in some of the taluks of Chittoor district with encouraging results. In the IV Circle, local tobacco is grown extensively in Coimbatore district and in Kasaragod taluk of South Kanara district. An enquiry was conducted in the latter area into the alleged malpractices of mixing sand with tobacco leaves and vigorous propaganda was conducted among the growers and merchants to make them desist from this practice.

(8) *Coconuts.*—Superior seed nuts and seedlings to the extent of 16,052 and 4,497 respectively were supplied to the public by the Agricultural Department as against 14,676 seed nuts and 4,306 seedlings in the previous year. The demand for their supply is on the increase and is being met from the Coconut Research Stations as far as possible.

(9) *Potato.*—In the Madras Province potato cultivation is confined almost entirely to the Nilgiris district. The variety "Great Scot" has now extended all over the district and its purity is being maintained at the Agricultural Research Station, Nanjanad. The Department of Agriculture arranges seed farms every year by supplying pure seed to some select cultivators who agree to sell at least a part of their crop to other cultivators for seed in the next season. The quantity of seed thus sold during the year by the seed farm ryots and the Research Station amounted to 139,586 lb. The total area under superior varieties of potato on the Nilgiris has now increased to 14,592 acres and the extra profit to the cultivators due to these varieties is estimated at Rs. 321,024 per annum.

(10) *Ginger*.—Ginger is mostly grown in the West Coast. In the II Circle, this crop is cultivated round about Kaluvoy village in Nellore district and is being tried in other places under departmental advice. In Tellicherry division 1,471 lb. of ginger seed were distributed.

(11) *Bengalgram*.—A quantity of 3,678 lb. of strain 482 was distributed in Coimbatore district. Due to unfavourable seasonal conditions, the area under this crop went down low this year.

(12) *Onions*.—The cultivation of Bellary onion is slowly spreading throughout the Province. As a subsidiary crop in citrus gardens in the II Circle, it gave a net profit of about Rs. 100 per acre in one garden. About 700 lb. of seed were supplied to ryots in different parts of the province.

(2) Fodder.

29. Ryots in all circles were persuaded to grow fodder crops to supplement their stock of straw. Fodder crops like fodder cholam, Pillipesara, Guinea grass, Elephant grass, Kolukkattai grass, Teosinte, maize and lucerne were cultivated. Preservation of fodder in silo pits was demonstrated in tracts where there were facilities, especially in the West Coast. The following seed and grass slips were supplied during the year for raising fodder crops :—

	Number.
Guinea grass and Napier grass slips	103,000
Kikuyu grass slips	5,000
	LB.
P.M. cholam	4,556
Maize	488
Teosinte	80
Lucerne	304
Kolukkattai grass seed	384

(3) Fruits.

30. Attempts were made to increase the area under fruit trees, such as, plantains, mango, oranges, sapota, limes, guava, pineapple, etc. In the I Circle, the plantain area under the improved methods of cultivation increased during the year to 4,636 acres from 1,151 acres in the last year. The demand for fruit plants continued in the I, II and IV Circles and steps have been taken to meet it as far as possible from the Departmental Fruit Research Stations and reliable private nurserymen. The fruit plants supplied through the departmental agency were as follows :—

Plantain suckers	6,993
Mango grafts	32,288
Citrus (limes and oranges)	22,470
Pineapple suckers	31,199
Sapota	2,437
Cashewnut	916
Guava, date, pomegranate and Zizyphus ..	381
Others	24,177

(4) Agricultural Implements and Machinery.

31. Demonstrations of the working of improved agricultural implements were continued as in previous years. Ridge ploughs and H.M. guntakas were in greater demand in the Vuyyur Sugar-cane area and Kifayat Rahat water lift gained some popularity in citrus garden areas. Round about Guntur and Tenali where cheap electricity is available, 15 wells were fitted with electric pumps in the place of old bullock mhotes. The following statement shows the number of demonstrations conducted in the Presidency with improved implements :—

	Number of demonstrations.
Improved ploughs	16,886
Improved guntakas	1,695
Roll-easy mhote wheel	2,689
Triangular harrow	176
Bund forming implements	1,032
Planet junior hoe	387
Buck-scraper	337
Chaff-cutter	225
Seed-drill	135
Sprayers	641
Persian wheel	11
Turmeric polishing machine	252
Cane mills	140
Cultivators	96
Digging and garden forks	186
Kifayat rahats	33
Mhote buckets	7
Archimedian screw	71
Pruning implements	1,678
Dusting machines	13
Power-driven pumps	7
Secateur	109
Other implements	3,180

The following statement shows the number of various implements sold during 1938–39 and 1937–38 through departmental agency :—

	1938–39.	1937–38.
Iron ploughs	6,608	4,339
* Spare parts for ploughs	6,186	5,187
Guntakas	140	81
Roll-easy mhote wheels	855	403
Chaff-cutters	11	6
Seed-drills	196	18
Bund-forming implements ..	26	14
Planet junior hoe	42	46
Buck-scraper	27	10
Sprayers and dusters	116	132

* These exclude the 746 plough parts obtained by the cultivators in Pollachi taluk, Coimbatore district, from the dealers direct.

	1938–39.	1937–38.
Sugarcane Mills	77	117
Archimedian screws	1	1
Pruning implements	14	49
Turmeric polisher	11	..
Other implements	709	686

(5) Livestock

32. The Livestock section was transferred to the Veterinary Department from 1st April 1939 and the work of maintenance of breeding bulls was administered by that department. The Agricultural demonstrators continued to give advice on poultry and on proper housing and feeding of cattle.

Apiary.—Bee-keeping as a side industry continued to gain rapid popularity. Numerous enquiries were received from various parts of the Madras Province and the demands of other provinces and States were met as far as possible. Demonstrations in hiving wild colonies and in the management of apiaries were given in different centres and apicultural exhibits were sent to various shows and exhibitions. The usual short course in bee-keeping was held in the month of February and the students who attended the course were given a thorough training in the practical aspects of the industry. The annual "Honey Week" organized by the Entomology section during April 1938 on a presidency basis created much interest in bee-rearing among the educated public in particular. A comb foundation machine was obtained from America to meet the demand for the supply of comb foundation sheets. The bulletin on "Bee-keeping" was revised during the year and a pamphlet in Telugu on "Practical Hints on Bee-keeping" was issued; there is great demand for the two publications. With the starting of Central Apiaries at Kalroddupalle in Chittoor district and Pithapuram in East Godavari district, very good progress in bee-keeping was possible in these areas. Stimulus was given to bee-keeping work in and around Madras by holding honey week and exhibiting bee-hives. Ninety-six demonstrations were given on honey extraction and 249 colonies were hived for the public and 72 hives were sold. In the III Circle, bee-keeping was given an impetus by the appointment of special messengers in Trichinopoly and Tinnevelly districts where wild colonies to the extent of 715 were hived. The following statement shows the amount of progress made in bee-keeping in the province during the year :—

	Number.
Bee-hives maintained	1,900
Demonstrations of better methods of extracting honey	358
Bee-hives supplied to parties	151
Honey extractors supplied to parties ..	12

(6) Loans.

33. Takkavi loans were granted to ryots to the extent of rupees 24,928 for the purchase of agricultural implements mentioned below during the period under report against Rs. 22,373 granted during the 12 months in the previous year.

	Number.
Ploughs	2,524
Water-lifts	37
Mhote wheels	516
Cultivators, Guntakas, Dantulus, Drill sets, bund-former	119
Sprayers	70
Spare parts of ploughs	60
Sugarcane crushers	7
Miscellaneous implements such as chaff-cutter, Secateur, digging fork, hand-gin, etc.	415

Loans for implements costing Rs. 25 and less were sanctioned by this department amounting to Rs. 18,188 while the Revenue Department sanctioned loans to the extent of Rs. 6,740. The ryots took advantage of these loans for the purchase of the implements very readily.

(7) Manures.

34. *Farm-yard manure.*—Better methods of preserving farm-yard manure continued to be one of the important items of propaganda and there were 34,168 manure pits, 34,105 dry earth sheds and 65 loose boxes under the direct supervision of the Agricultural Demonstrators throughout the province.

Composting of night soil with municipal rubbish was successfully demonstrated in the II Circle and Proddatur, Hospet and Nellore Municipalities and Rajampet and Pattikonda Panchayat Boards have taken to the manufacture of composts. In the III Circle, the conversion of all habitation wastes, cane trash, groundnut husk and other organic wastes into compost was advocated. and the Bangalore method of preserving manure was adopted in Palni taluk. The total number of compost pits maintained during the year was 5,352 as against 3,063 in the previous year.

Green manures.—The crops recommended by the department as suitable for green manure are Dhaincha, Sunnhemp, Wild Indigo, Indigo and Pillipesara. The area under these crops is steadily increasing though not so rapidly as one would wish from the point of their importance. The total quantity of green manure seed supplied to the cultivators during the year was about 346 tons and the area sown was 288,184 acres. Special attention was paid in the Ceded districts to bring home to the cultivators the advantages of these crops in consideration of the shortage of cattle manure and the difficulty of obtaining bulky organic manure at a reasonably low cost in these districts.

(8) Pests and Diseases.

35. The control measures against silver shoot fly of paddy were continued in the Chicacole taluk of Vizagapatam district by the application of deterrants like Neem cake, Margosa oil and Crude oil emulsion and the setting up of light traps for attracting moths. The application of neem cake was found to be effective against insect pests. At Bezwada, a Mycology Assistant was posted for one year to demonstrate the methods of controlling Collar rot and gummosis on citrus in 16 gardens which were badly affected at Patamata lanka and in the neighbouring villages. The treatment was found fairly effective and it is being continued. In Bellary division, "Hairy Caterpillar" attack was very serious on early crops and was checked by the timely diversion of famine labour working in the locality for hand-picking the insects. An area of 8,800 acres was thus freed from the pest.

A very serious outbreak of "Spodoptera" on paddy occurred towards the close of the year throughout Malabar. The greatest damage was reported from Payyanur and surrounding villages. Though the pest appeared suddenly, the Agricultural Demonstrators and the Special Assistants deputed by the Government Entomologist toured in the affected areas and did considerable propaganda work by demonstrating remedial measures.

The usual spraying against the "Mahali" disease of arecanuts was continued in the West Coast.

Other pests and diseases against which remedial measures were demonstrated were mottled leaf on orange, thrips on chillies, epilachna on brinjals, prodinea and aphis on tobacco, hoppers on mangoes, smut diseases on jonna, betel vine wilt, swarming caterpillar on paddy, piricularia on paddy, nephantis and stem bleeding disease on coconuts, mildew on grapes and caterpillars on jasmine.

(9) Agricultural Marketing.

36. *Marketing survey.*—The marketing survey reports on six commodities, viz., citrus fruits, wool and hair, barley, coconuts, sheep and goats and mangoes were completed during the year. A preliminary report on sugar was also furnished to the Agricultural Marketing Adviser to the Government of India. The surveys of mustard and rape, sugar, maize, gram, fish, lac and cashewnut were continued. Additional data and statistics also were collected to bring up to date the survey reports already sent to the Agricultural Marketing Adviser to the Government of India.

Grade Standards.—Two hundred and seventy commercial samples of various commodities were collected from different markets of the presidency and sent to the respective officers for analysis.

Development work.—Grade specifications were drawn up for Red Sirumani and White Sirumani rice of Tanjore and milled raw Molagolukulu rice of Nellore. Two rice grading stations, one at Nellore and another at Kuttalam were opened and nearly 26,000 maunds of rice were graded and labelled at these stations up to

the end of June 1939. The Egg grading stations in the Guntur district continued to function and over 3 lakhs of eggs were graded and marketed by the Egg Marketing Society in the district. In the City of Madras, a large type of egg-grading machine capable of handling 1,500 to 2,000 eggs per hour has been installed and the possibilities of grading eggs in the City are being investigated. At Guntur, 626 bales of Virginian tobacco worth about Rs. 50,000 were graded as per Indian Tobacco Association standard grades.

Grade specifications for mangoes and oranges also were drawn up and the work of grading the two commodities was started at Chittoor and Madras respectively.

The Egg Marketing Society, Ongole, the Koduru Fruit Growers' Association, the Michælpafayam Fruit Growers' Society, the Nilgiris Potato Growers' Society and the North Malabar Fruit Growers' Association marketed their produce through the Provincial Marketing Society at Madras. Direct touch was established between the Society and markets in Bombay, Punjab and Bengal. A Society at Vangal in Trichinopoly district for marketing plantains has been registered and another at Mayanoor in the same district is in the course of registration. The Nilgiris Potato Society was given all help to market the produce in the cities in North India. From April 1939, the Commercial Crops Markets Act was enforced for groundnut transactions in South Arcot and for tobacco in Guntur district and Bezwada taluk of Kistna. Help was rendered in the preliminary work of application of the Act by way of drawing up the by-laws, issue of notifications, arrangements of staff, etc.

Special reduced rates for a number of commodities like plantains, limes, eggs, milch cows, etc., were obtained from South Indian and Madras and Southern Mahratta Railway Administrations. Reduced rates for plantains stimulated the movement of plantains from the Godavari district.

A special enquiry was made in the export trade of Madras rices to Ceylon and a report embodying various recommendations for the expansion of rice trade in Ceylon was submitted to Government. Investigations were also carried out on the organization and development of plantain trade in the Cauvery valley, opening of more ports in Tanjore district, development of free fatty acid in groundnut and methods of sampling groundnut.

Work through other agencies.

(1) Co-operation.

37. (*a*) The Co-operative organizations in the Province took part in distribution of improved seeds and implements, grant of crop loans and co-operative marketing of ryots' produce.

In the I Circle, the Loan and Sale Society at Anakapalle sold 150,320 maunds of jaggery, 7,663 maunds of onions, 1,260 bags of paddy and 13,629 bags of manure; the Bimilipatam Society sold 4,677 bags of groundnut.

In the II Circle, the Loan and Sale Society at Nandyal marketed 206,600 lb. of groundnut and 3,300,000 lb. of ginned cotton. The Loan and Sale Society at Bellary was revived. In Chittoor and Chingleput districts, a few Co-operative Societies took up the work of multiplication and distribution of improved seeds and the purchase and hiring of implements to their members. A Bee-keeping Co-operative Society was started in Chittoor.

In the III Circle, the Loan and Sale Society at Marudur, Kulittalai taluk, sold 2,000 bags of paddy and advanced Rs. 4,000 as produce loans and Rs. 2,000 as crop loans. The Sivagnanam Co-operative Agricultural Society at Lalgudi, distributed 70 tons of oil-cake and 1,000 tons of artificial manures and gave Rs. 1,786 as crop loans and Rs. 17,716 as produce loan, i.e., on the pledge of produce. The Grape Growers' Society at Michælpalayam, Nilakkottai taluk, sold 13,298 maunds of grapes to the value of Rs. 24,625 and distributed 6 cwt. of copper sulphate for spraying. A plantain marketing society was started at Vangal in Trichinopoly district.

In the IV Circle, the Tiruppur Co-operative Sale Society continued the work of production and distribution of Co. 2 Cambodia cotton seed. This Society was given the help of a special demonstrator and a Demonstration Maistry paid by the Indian Central Cotton Committee for a period of one year to attend to this work.

(b) *Sugar Excise Fund—Subsidy to Sugarcane Growers.*—The scheme of assistance to sugarcane growers financed by the Government of India entered on its second year of working. The actual administration of the grant is in the hands of the Co-operative Department. The main objects for which the subsidy is given are the introduction of improved varieties of cane suitable to different factory areas with a view to extend the working season of the factory and the adoption of measures to protect the cane crop from insect pests and diseases, financing of cane growers through Co-operative societies, improvement of means of communications for the transport of cane and safeguarding the interest of ryots in the matter of weighment, and delay in the disposal of cane, etc. The functions of the Agricultural Department in the working of the scheme are confined to the deputation of qualified Agricultural Demonstrators to attend to the above mentioned objects and their work is being supervised by departmental officers. The factory areas at Anakapalle, Bobbili, Kirlampudi, Vuyyur, Hospet, Nellikuppam, Coimbatore, Kalyanpur, were supplied each with one Agricultural Demonstrator. The Agricultural Demonstrator at Kalyanpur was later on withdrawn as the factory ceased working. The work of the agricultural staff was satisfactory in spreading superior varieties of cane in the factory areas.

(2) Agricultural Associations.

The Fruit Growers' Association at Vizagapatam conducted a Fruit Show this year as in last year. The marketing of Sapota

fruits is being carried on with the Provincial Co-operative Marketing Society at Madras by the Fruit Growers' Association at Pithapuram.

In the II Circle, special efforts were made during the year for starting as many Agricultural Advisory Committees as possible and no fewer than 365 such Committees were organized. They have created considerable amount of interest among the cultivators in all matters pertaining to rural development.

In the IV Circle, an agricultural association was formed at Unai in North Arcot district on 1st March 1938 to spread agricultural improvements on a large scale and a demonstration maistry was stationed at Unai for this work. The association now consists of 47 members residing in Unai and three adjoining villages. It purchased from the department during the year 55 ploughs, 2,600 lb. green manure seeds, 2,400 lb. of paddy and other seeds, 5,000 sugarcane setts, 143 seed coconuts and one Kangayam breeding bull. There are now 40 sugarcane cultivators against 3 before the starting of the association. The progress is satisfactory.

(3) (i) Koya Uplift Scheme.

A scheme has recently been sanctioned by Government to improve the economic condition of the Koyas in three villages in Bhadrachalam taluk of the East Godavari district. Two improved ploughs were supplied for their common use and kept in charge of the Patels of the villages. Two ryots were selected from each of the three villages and they were provided with a pair of cattle each. Improved seed was supplied to them free of cost at the time of sowing and recovered an equal quantity of seed at the time of harvest. Among improvements effected, the performance of T.6 jonna is very much appreciated for its increased yield.

(ii) Work in Prohibition area.

Rural development work was taken in hand side by side with prohibition work in Salem district. Five rural uplift schools were arranged by the Collector and the Agricultural Officers. The Assistant Director, Tiruppattur, took a few classes and impressed on the boys the possibilities of agricultural improvements.

VI.—LEGISLATION.

38. *Cotton Ginning and Pressing Factories Act.*—This Act continued to be in force. Twenty-seven new ginning factories—7 each in Anantapur and Bellary districts, 3 each in Madura and Tinnevelly districts, 1 in Kistna district, 2 in Guntur district and 4 in Coimbatore district—were erected during the year while three old factories ceased to work. The total number of ginning factories working at the close of the year was 547. There were two prosecutions in the course of the year for infringement of the provisions of the Act. Of the 62 pressing factories, one was reported to be out of order and ceased to work in the year.

39. *Cotton Transport Act*—(i) *Single licences by rail.*—Twenty-six licences during the cotton year 1st February 1938 to 31st January 1939 and 10 licences from 1st February 1939 to 30th June 1939—total 36—were issued during the year along with a certified copy in each case. Of these, one related to the import of carded cotton by the All-India Spinners' Association into Tadpatri from Arkonam, one to the import of kapas of three varieties under trial at Cumbum into Nandyal by the Agricultural Department for ginning and further experiments, and three to the import of lint to Mettur for testing by the Mettur Industries, Limited. The remaining 31 licences related to the import of cotton waste into the two protected areas for purposes of making beddings and pillows.

(ii) *Annual licences.*—Thirty-four general licences with 667 certified copies were issued to the cotton mills mostly in the Coimbatore district in the "southerns" protected area for import of ginned cotton by rail during the cotton year 1938–39 as against 30 licences with 729 certified copies issued during the cotton year 1937–38. Of the 667 certified copies issued, the mills utilized 514 copies and returned the remaining 153 copies as unused. The number of certified copies utilized in the previous cotton year was 578.

In addition to the above, 33 general licences with 697 certified copies pertaining to the cotton year 1939–40 were issued to the mills in the period from 1st February 1939 to 30th June 1939.

(iii) *Licences by sea.*—One hundred and fifty-six licences were issued during the year for the import by sea of 100,474 bales of ginned cotton into the Tuticorin port as against 119 licences for 73,371 bales issued in 1937–38.

40. *Cotton Control Act.*—The enforcement of this Act prohibiting the cultivation and mixing of pulichai cotton (*g. neglectum*) was continued during the year in the three southern districts. Fifty-seven prosecutions were launched in Tinnevelly district against persons who were found growing this cotton either pure or as a mixture with other cotton and in most of the cases the plants were pulled out. A ginning factory proprietor was also prosecuted for possession of this cotton.

41. *Commercial Crops Markets Act.*—(i) The enforcement of this Act (Act XX of 1933) in respect of cotton in the Tiruppur Municipality was continued and the Tiruppur Cotton Market Committee constituted under the Act continued to function for the third year. The term of the members of the Committee elected in 1935 expired on the 31st December 1938 and fresh elections were held during that month. Sri D. O. Asher was re-elected as Chairman. Nine meetings of the Committee were held during the year under report. Only one dispute was referred to the Committee for arbitration. Dissemination of market information was continued as in the previous year. The Committee is maintaining statistical data.

regarding purchase, sale, ginning and pressing, stocks and quantity of cotton accounted for in Tiruppur. At the close of the year, the Commitee purchased the Holmes Cotton Market from the Tiruppur Municipality at a cost of Rs. 60,000 with the help of a loan from Government, and has since taken steps to provide godown accommodation and other facilities for marketing. The question of enforcing this Act to other parts of the Coimbatore district is engaging attention.

(ii) From the 1st April 1939 the Act was applied to the South Arcot district in respect of groundnut and to the Guntur district and Bezwada taluk of the Kistna district in respect of tobacco. The members of each of the Market Committees in Cuddalore and Guntur were nominated by Government in the first instance. Sri A. Lakshminarayana Reddiyar was elected as Chairman of the South Arcot Groundnut Market Committee, Cuddalore O.T., and Sri V. V. Punnaiya as Chairman of the Guntur and Bezwada Tobacco Market Committee, Guntur. Five meetings of the former Committee and three of the latter Committee were held between April and June 1939 and draft by-laws and other preliminaries settled. Suitable markets and market-yards have been established in important places for facilitating marketing. The services of suitable upper subordinates of this department have been lent to each Committee.

(iii) Government declared their intention of enforcing the Act in the municipal areas of Nandyal in the Kurnool district and of Adoni in the Bellary district in respect of cotton and issued a draft notification in March 1939. The notification has since been confirmed.

42. *Pest Act—The Madras Agricultural Pests and Diseases Act,* 1919 *(III of* 1919) *as amended by Act VII of* 1925.—(i) This Act continued to be in force during the year in respect of the diseases and insect pests affecting Cambodia and Pachanadan cottons, groundnut, palmyra and coconut and for the eradication of water hyacinth.

Cotton.—The Act was availed of for the eradication of two insect pests "Stem-weevil" (*Pempheres affinis*) and "pink boll worm" (*Galechia gossypiella*) attacking Cambodia and Pachanadan cottons in the districts of Salem, Trichinopoly, Madura (except in certain villages in the Tirumangalam taluk) and Coimbatore. The removal of cotton plants before the prescribed date was complete in the Salem district while in the Coimbatore district an area of 46 acres was left uneradicated. The Trichinopoly district had the largest area, viz., 17,261 acres, with the crop standing on the prescribed date, the area outstanding in the Kulittalai taluk alone being more than double that of last year. The whole area (except Kulittalai taluk) was cleared up by the 30th September while the crop in the Kulittalai taluk was pulled out by the 18th November 1938. In the Madura district, the area left uncleared on 1st September 1938 was 1,934 acres which was, however, cleared up by the 30th October 1938.

In the Anamalai special tract of the Pollachi taluk where the date of uprooting the plants was fixed as 30th September 1938 an extension of 21 days was granted.

In the ten villages of the Coimbatore taluk, opposite the Palghat gap, the last date for removal of the crop was fixed at 15th June 1938, the new crop being sown only from 1st August 1938. This special treatment was necessitated by the peculiar monsoon conditions obtaining in this area and it has not affected the smooth working of the Act in the ten adjacent areas.

The Mallapuram Hills of the Tirumangalam taluk in the Madura district offered serious obstacles in the way of enforcing the Act by reason of its peculiar situation. The possibility of exempting this area from the operations of the Act without adversely affecting the working of the Act in the adjacent areas was explored at the close of the year.

(ii) *Groundnut.*—The Act against the red hairy caterpillar pest (*amsacta albistriga*) on groundnut and other dry crops continued to be in force in the Tekkali and Narasannapeta taluks of the Vizagapatam district. Campaign against the pest over an area of 44,000 acres was successfully conducted without enforcing penal provisions. The Act in respect of this pest was also in force in the districts of North Arcot, South Arcot, Chingleput (Chingleput, Sriperumbudur and Trivellore taluks) and Trichinopoly (Udaiyarpalayam and Musiri taluks). The campaign in the North Arcot district was conducted from 15th July to 30th September 1938 and the pest was brought under control without serious consequences. In the other districts the emergence was not severe and was properly dealt with without any material damage to crops.

(iii) *Water hyacinth.*—The Act in respect of this weed was in force in the districts of Tanjore, Chingleput, Madras and Malabar (portion).

(iv) *Palmyra and coconut.*—The enforcement of the Act in respect of the bud-rot disease of palmyra and coconut continued to be in force in the taluks of Palghat, Walluvanad and Ponnani of the Malabar district. The number of trees operated was 4,209. Bud-rot of palmyra was prevalent in a virulent form in the East and West Godavari districts and the Act was enforced in these two districts also.

Cardamom.—Proposals were made to Government to declare the "Mosaic" or "Marble" disease as a plant disease injurious to the cardamom crop in the Nelliampathies in the Palghat taluk of the Malabar district.

Inspection and certification of agricultural commodities exported from the Presidency.—In August 1937 Government laid down the procedure governing the inspection and certification of tamarind intended for export, particularly to Egypt, by the Entomological and Mycological staff of the department. Seventy consignments of tamarind intended for export to Egypt from Madras were examined

in accordance with quarantine regulations and certificates issued. Fees collected for the issue of these certificates amounted to Rupees 1,400. Three consignments of live plants intended for export to the United Kingdom were also examined and certified.

The Provincial Marketing Officer was authorized by Government to issue certificates of origin in respect of agricultural commodities exported from this province by or on behalf of members of associations started by the Marketing Section while the Assistant Director of Agriculture, Guntur, was empowered to issue such certificates for tobacco exported from his jurisdiction.

In order to comply with the requirements of the Ordinance issued by the Government of Ceylon in July 1938, the Deputy and Assistant Directors of Agriculture were authorized to issue certificates of origin for fruits grown within their respective jurisdictions and exported to Ceylon.

Deputy Directors with coffee-growing areas in their jurisdictions were also empowered to issue certificates of origin for coffee exported outside the Presidency.

VII.—PUBLICATIONS.

43. The Villagers' Calendar was, as usual, published in English, Tamil, Telugu, Kanarese and Malayalam languages. In addition, 16 leaflets, 4 pamphlets, 8 broad hints and 22 press notes on various subjects of practical interest were printed in English and local languages for issue free to ryots and others interested in agriculture. Three priced publications on the Marketing of Wheat in the Madras Presidency, Hints on Bee-keeping and the Cultivation of Citrus in the Northern Circars were also issued. The new feature during the year in connection with the dissemination of agricultural knowledge to the public is the issue of short talks on matters relating to agriculture by the officers of the Agricultural Department through the All-India Radio Agency at Madras and Trichinopoly. The number of talks thus issued during the year was 23 and most of them were in Tamil and Telugu, only a few being in English. These publications and talks were not only helpful for giving publicity to the activities of the department among the educated public but were also useful to the ryot population. The details of the publications and talks are given below :—

Subject.	Languages in which published.	Price.
		RS. A. P
	Books.	
1 The Villagers' Calendar ..	English, Tamil, Telugu, Kanarese and Malayalam.	0 1 0 *
2 Marketing of Wheat in the Madras Presidency.	English	2 4 0
	Leaflet series.	
1 Red Hairy Caterpillar pest ..	English, Tamil and Kanarese.	Free.
2 The mango hopper	Tamil and Telugu	Do.
3 Evils of Damping groundnut.	English, Tamil, Telugu, Kanarese and Malayalam.	Do.
4 Reclamation of saline soils ..	Do.	Do.

* Each.

Subject.	Languages in which published.	Price.
	Leaflet series—cont.	
5 Bullock harness	English, Kanarese and Malayalam.	Free.
6 The improved circular mhote water lift.	English, Telugu and Kanarese.	Do.
7 Preparation in the home of infant and invalid food from cholam.	English	Do.
8 Manufacture of active carbon from paddy husk.	English, Tamil, Telugu, Kanarese and Malayalam.	Do.
9 The coconut caterpillar ..	Do.	Do.
10 Army worm of paddy ..	Tamil	Do.
11 Note on the cultivation of sugarcane in Tanjore delta.	English and Tamil	Do.
12 Care and management of cattle manure in South India.	English and Malayalam ..	Do.
13 Improved turmeric polisher ..	Tamil, Telugu, Kanarese and Malayalam.	Do.
14 The earth scoop	Do.	Do.
15 Tamil songs on Agriculture ..	Tamil	Do.
16 Bud-rot of palmyra	Telugu	Do.
17 Some hints on Bee-keeping ..	Tamil and Telugu	Do.
18 Improved ground-nut ..	Tamil, Telugu, Kanarese and Malayalam.	Do.
19 Note on Nilgiri Agriculture ..	Kanarese	Do.
20 Coconut cultivation	Telugu	Do.
21 Feed your cow	Kanarese	Do.
22 Feed and work your cow ..	Tamil, Telugu, Malayalam and Kanarese.	Do.
23 Plough early	Telugu, Kanarese and Malayalam.	Do.
24 Plough efficiently	Do.	Do.
25 Sow good seed	Do.	Do.
26 Beware of weeds	Tamil, Telugu, Kanarese and Malayalam.	Do.
27 Feed your cow and keep good bullocks.	Telugu, Kanarese and Malayalam.	Do.
28 Dedication of breeding bulls of Ongole breed.	Tamil, Telugu, Kanarese and Malayalam.	Do.

Bulletins.

		RS. A. P.
1 Hints on Bee-keeping ..	Tamil	1 0 0
2 The cultivation of citrus in the Northern Circars.	English	0 4 0

Press notes.

(1) The note on "Molascake" as cattlefood.

(2) The need to put up bunds in the dry lands of the Bellary black soils.

(3) Compost making.

(4) New strains of paddy released during the year 1937–38 from different paddy breeding stations in the Presidency.

(5) Treatment of jonna seed with sulphur dust against smut.

(6) Epilachna on brinjal and its control in the Anakapalle area.

(7) The Sindewahe furnace and turmeric boiling at Cumbum (Kurnool district).

(8) The importance of heavy manuring for paddy nursery.

(9) A simple device for covering seed sown with the drill.
(10) Note on silage making on the West Coast.
(11) Mahali or koleroga disease of arecanuts.
(12) Marketing survey of ghee and butter.
(13) Do. of milk.
(14) Do. of eggs.
(15) Do. of fruits.
(16) Do. of hides and skins
(17) Do. of wheat.
(18) Do. of cattle.
(19) Do. of linseed.
(20) Do. of coffee.
(21) Do. of wool and hair.
(22) Do. of fairs and markets.

Radio Talks.

	Languages in which talk was given.
1 Cottage Industries—Malt	Tamil.
2 Co-operative marketing	Telugu.
3 Cattle wealth	Telugu and Tamil.
4 Agriculturist in the field	Telugu.
5 Care of your crops	Tamil.
6 Wealth from waste	Do.
7 The harm that rain does or soil erosion	Do.
8 Millets—Foodcrops of the poor	Telugu.
9 Marketing rice	English.
10 Improved ploughs	Tamil.
11 Bee-keeping	Telugu.
12 Fruit culture	English.
13 Soil fertility	Telugu.
14 Long staple	Do.
15 Improved water lifts	Tamil and Telugu.
16 Fruit nurseries	Do.
17 Tillage	English, Tamil and Telugu.
18 What plant breeding has done for the improvement of paddy in Madras.	Do.
19 How can royts help the spread of pure seed.	English, Telugu and Tamil.
20 Amelioration of rice cultivation practices and results of manurial experiments.	Do.
21 Insect pests of paddy and their control	Do.
22 Diseases of paddy	Do.
23 Marketing of rice	English and Tamil.

VIII.—Statistics.

44. *Weekly cotton mill and press returns.*—There were 52 spinning mills working in the Presidency during the year. All of them continued to send the weekly returns of cotton received in stamped forms furnished by the department. These returns being voluntary, repeated reminders had to be issued in the case of a

few mills before the figures could be obtained. Returns from the Cotton presses and from the Customs authorities were quite regular.

45. *Crop cutting experiments*.—Owing to the adverse seasonal conditions in several districts in the Presidency and late receipt of instructions for the conduct of crop cutting experiments, Government ordered that the results of experiments carried out in 1937–38 should be ignored and experiments on paddy, cholam, cumbu, ragi and sugarcane, should be repeated in 1938–39 and 1939–40. The results received during these two years have been forwarded to the Director of Industries and Commerce for tabulation.

IX.—Expenditure.

46. The receipts and expenditure for the year 1938–39 and the corresponding figures for the previous year are given below :—

	1937–38.	1938–39.
	RS.	RS.
Expenditure	22,36,676	20,62,316
Receipts	3,54,945	3,00,147
Net expenditure ..	18,81,731	17,62,169

The above figures include Rs. 1,41,086 under expenditure and Rs. 1,41,923 under receipts for 1937–38, and Rs. 1,25,649 under expenditure and Rs. 1,24,510 under receipts for 1938–39, on account of schemes financed by the Indian Central Cotton Committee and the Imperial Council of Agricultural Research. Excluding the expenditure on schemes, the decrease in expenditure from that of 1937–38 is due to (1) transfer of Live-stock Section to the Veterinary Department, (2) amalgamation of teaching with research, (3) re-organization of circles, and (4) retrenchment and general economy in expenditure. The decrease in receipts is due to bad seasonal conditions throughout the Presidency.

X.—Programme of Work for 1939–40.

A. *Chemistry*.—Analytical and advisory work will continue.

Irrigation Research.—The following problems will be studied at the Agricultural Research Station, Siruguppa :—

(1) Influence of irrigation on the movement of salts in the soil profile;
(2) Study of pH. exchangeable bases and mechanical composition of soils as a result of irrigation;
(3) Limits of tolerance of crops for various salts;
(4) Manurial requirements of black soils;
(5) Drainage, seepage and composition of drainage water in black soils.

Agronomic work of Siruguppa.

(1) New crops and varieties;
(2) Rotations;
(3) Time of sowing;
(4) Mixture of crops;
(5) Rate of application of water.

Research on soils.

(1) Study of the origin and Geo-chemistry of soils;
(2) The nature and distribution of organic matter on black soils;
(3) The organic colloids of black soil;
(4) Decomposition of organic matter in relation to humus formation;
(5) Study of soils of Kistna and Godavari deltas;
(6) Factors affecting soil pH.;
(7) Methods of determination of exchangeable bases in alkaline soils;
(8) Reclamation of alkaline soils.

Plant nutrition.—Influence of manuring of seed-bed on subsequent growth of paddy, on quality of plantain, on the non-sugar organic matter in cane juice and on crop quality in cereals.

Animal nutrition.—Study of protein requirements for working bullocks, of mineral metabolism, biological value of cereals and pasture studies.

Microbiology.—Studies on Nitrogen fixation by Azoto-bacter inoculation, on the microbiological population of black soil before and after irrigation, on the micro-flora of soils irrigated with sewage and effluent water from the activated sludge plant, on fermentation of molasses for production of power alcohol and on keeping quality of milk.

Sugarcane and jaggery work.—Continuation of the studies on the arrowing and maturity of canes and the quality of jaggery. Preparation of active carbon from waste materials, investigation of other uses for carbon and cause of development of colour in jaggery.

Malting of cholam.—Clinical test on malt cholam, bio-chemical studies on the malt grains and foods, blending of malt foods, technique of packing malt foods and varietal tests with cholam for malting purposes. Malting of paddy and other cereals will also be studied.

B. *Botany.*—(*a*) Continuance of the survey of bananas in North Arcot district and study of the common indigenous fodder grasses and fresh introductions,

(*b*) Floristic survey of South Kanara district.

C. *Cereals*—(1) *Millets.*—Studies on the inheritance of characters in Sorghum, varietal studies and selections for yield and hybridization between local varieties and imported economic types,

improvement of fodder value of cholam straw, comparative trials for yield of the various millets, selection of varieties suitable for malt-making, striga resistance and "yellow leaf" resistance and evolution of short duration and economic strains in ragi, korra and cumbu.

(2) *Paddy.*—Maintenance of purity and multiplication of Coimbatore, Maruteru, Pattambi and Aduturai strains so far evolved, economic work by hybridization, cultural, manurial, seasonal and irrigation experiments, evolution of strains which combine high yield, resistance to diseases, alkalinity and drought. Electrocultural experiments to test the effect of seed treatment on final yield will also be undertaken.

(3) *Cotton.*—Multiplication of strains X. 3915 and 4383 and their yield trials in Salem, Madura and Coimbatore districts, yield trials of strains evolved in the Madras Herbaceum Scheme in Ramnad, Tinnevelly and Coimbatore districts. Comparison of promising bio-types in cyclic crosses, inducing polyploidy by means of Colchicine, conduct of progeny row trials from among the plants selected in the cyclic crosses; isolation of drought resistant types from Tomantosum crosses and study of inheritance of lintlessness, floral anatomy, lint colour, boll opening, leaf-lobing, and development of fuzz.

Indian Central Cotton Committee Schemes.—Work on the schemes in force will be continued as per programmes approved by the Indian Central Cotton Committee. The Cocanada Scheme sanctioned last year will be brought into effect.

(4) *Sugarcane.*—Meteorological studies, chemical studies, botanical study of germination, tillering, growth, thickness, weight, habit and arrowing, physiological study of root system of promising varieties, study of morphological characters of promising varieties and their identification under field conditions; cultural and varietal trials, and study of fibre content, rind hardness, sugar recovery, deterioration of cane after harvest, effect of irrigation on the quality of juice and the keeping quality of jaggery will be continued.

(5) *Fruits.*—Budding and grafting experiments, root stock trials, seed selection work, import of new varieties of fruit plants for trial, varietal trials of citrus and mangoes will be continued. Programme of work approved by the Imperial Council of Agricultural Research for the Fruit Research Scheme at Kodur will be carried out.

(6) *Root crops.*—Selection work on potatoes, study of botanical characters and comparative trials of promising varieties, evolution of varieties by inter-varietal and inter-species crosses, study of dormancy of potato tubers, keeping quality of potatoes and trials with potato fertilizer mixtures.

(7) *Oil-seeds—Groundnuts.*—Seed multiplication of improved varieties, mixed cropping of groundnut with cholam, castor,

cumbu, redgram and cotton compared with pure groundnuts, treatment with colchicine to produce polyploids and study of varietal resistance to Rhizoctonia.

Castor and gingelly.—Selection and seed multiplication of promising strains and horticultural types, and selection and hybridization for high yield, earliness, high oil content and hardiness.

Coconuts.—Cultural and manurial experiments, morphological classifications and study of anthesis in world varieties of coconuts and study of root system of seedlings, progenies of economic crosses, button shedding and preservation of seed coconuts.

The programme of work approved by the Imperial Council of Agricultural Research in respect of coconut and groundnut schemes will be carried out.

(8) *Spices and Narcotics.*—Multiplication of better yielding types of chillies, study of varieties resistant to thrips, and inheritance of morphological characters and trial of other promising types of chillies, selections of tobacco from cyclic crosses and of types suited to pipe, cigar, cigarettes, hookah and beedi and distribution of H.S. 9 tobacco selection and manurial trials of Virginia tobacco in relation to its colour.

(9) *Miscellaneous.*—Studies of different varieties of plantains and multiplication of promising ones. Experiments on the cultivation of sunnhemp and linseed for fibre, cultivation of berseem for fodder. Comparison of promising selection of green-gram and trial of Pusa varieties of gogu and wheat and different varieties of soya beans.

Pulses.—Comparison of yields of types of drought resistant varieties of redgram, isolation of strains of redgram for earliness, colour and size of seed and multiplication of seeds of promising strains of redgram, multiplication of seeds of Bengal gram strains Nos. 482 and 462 and study of promising types in progeny rows.

D. *Entomology.*—Continuation of study of pests on paddy, cotton, sugarcane, fruit trees, coconut, vegetables, stored products, castor, chillies, tobacco, etc. Special researches on pests as the sugarcane moth borer, the cotton stem-weevil, the cholam yellow leaf disease, the fruit sucking moth, Pollu beetle of pepper, the cardamom thrips. Studies of economic families of insects—Bruchidae, Chalcidae, Braconidae and Ichneumonidae, and research on various aspects of bee-keeping such as study of bee pasturage plants, pollen substitutes, bee enemies, swarm prevention methods and flight activity of bees in relation to weather and pasturage conditions.

E. *Mycology.*—Study of piricularia and helminthosporium of paddy and ragi, smut and yellowing disease of cholam, red rot and mosaic disease of sugarcane, wilt on betel vine, cotton and pulses, virus diseases of tobacco, brinjal and cardamom, Mahali and

Gloesporium blight of areca palm, leaf fall and fruit drop of citrus, and soft rot of ginger will be continued. Joint experiments with the Government Entomologist will be conducted to control "Pollu" disease in North Malabar.

F. *Implements*.—The re-designing and improvement of seed-drill, R.E. Guntaka, paddy land puddlers, green manure trampler, paddy husking machines, double furrow basin lister, hand-power cotton gin, designing of a reversible disc plough, a simple adjustable mould board plough, a spring tyned expanding cultivator, a simple butter churn and an improved buck-scraper, the trial of different types of water-lifts for efficiency, tests of winnowing machines prior to recommendation for sales. The following problems will be undertaken in addition to the above :—

(1) Improved turmeric boiling pans and furnaces.
(2) Trials with arecanut dehusking machine.
(3) Designing of a groundnut lifting guntaka.
(4) Designing of groundnut decorticators.
(5) Comparative study of different paddy hullers and polishers.
(6) Trials of bullock power sugarcane crushers.
(7) Study of dynamic properties of soils and study of mould boards.
(8) Preparation and polishing of dry ginger for better marketing purposes.
(9) Designing a simple rotary hoe for bullock power.
(10) Production of agricultural cinematograph films.

G. *Irrigation*.—Study of the requirements of water for paddy, sugarcane and plantain will be continued.

H. *Marketing*.—The marketing surveys of gram, sugar, mustard and rape, cashewnut, maize, fish and prawns, lac and jute, extension of Commercial Crops Markets Act to the whole of Coimbatore district and to Nandyal (Kurnool district) and Adoni (Bellary district) markets for cotton, formation of associations of growers and traders for pooling, grading and marketing of produce, grading of eggs and tobacco in Guntur district, rice in Tanjore and Nellore districts, mangoes in Chittoor and oranges in the Madras City, starting of one or two grading stations for ghee, grading of rice in Kistna district (Bezwada), potato in the Nilgiris, fixing the standard grades and contract forms for hides and skins and groundnut in consultation with the Agricultural Marketing Adviser to the Government of India and the interests concerned and investigations of cold storage methods for fruits, potato, fish, eggs, etc.

AGRICULTURAL RESEARCH STATIONS.

Anakapalle—Sugarcane.—Meteorological, chemical and botanical studies as in previous years, cultural, varietal and manurial trials and study of fibre content and sugar recovery and keeping quality of jaggery.

Paddy.—Multiplication of improved strains, green manure experiments, single plant selections, varietal and yield trials and trial of local varieties of dry land paddy.

Ragi.—Trial and multiplication of improved strains evolved by the Millets Specialist and isolation of pure types and single plant selections.

Other crops.—Multiplication of improved strains of groundnut, growing of Cambodia cotton, chillies, tobacco, korra and ganti, demonstration of propagation of fruit plants by budding, grafting, layering, etc., and supply of fruit plants, and trials of root stocks for Vadlapudi and Batavian oranges.

Maruteru—Paddy.—Pure line selection, hybridization and acclimatization of exotic types, trial of deep water varieties in areas subjected to floods, inducing mutations by artificial means, cultural and manurial trials, irrigation experiments and multiplication and distribution of pure seeds of strains.

Other crops.—Economics of five-year rotation with paddy, sugarcane and plantains, and trials of growing cotton after first crop paddy will be continued.

Samalkota—Sugarcane.—Study of irrigation experiments and manurial experiments, yield trials of promising varieties, cultural trials, study of effect of lodging on the quantity and quality of cane and seed multiplication and distribution.

Paddy.—Study and comparison of pure line selections, trial of varieties in the inter-season, manurial experiments and seed multiplication and distribution.

Plantains.—Study of varieties planted in different seasons, of manurial experiments, hybridization, preparation of plantain figs and multiplication of promising varieties.

Other crops.—Study of redgram, dolichos lablab, Pusa wheat, vegetables, pineapple varieties and sunnhemp fibre studies under the Imperial Council of Agricultural Research Scheme.

Work on poultry and bee-keeping will be continued.

Guntur.—Selections, purity tests, comparative yield trials of cotton, chillies, tobacco, gogu, cholam, sajja, variga, korra, maize and groundnut will be continued.

Other crops.—Selections and trial of Bengalgram, redgram, soya beans, Pusa wheat, castor, berseem, preparation of composts and poudrette and their application to crops for study of their manurial value, and silage making and bee-keeping for demonstration.

Buchireddipalayam.—Study and trial of varieties of paddy, selection work in local varieties, hybridization, isolation of blast resistant cultures in Molakolukulu and experiments on the effect of planting seedlings of different ages.

Fruit Research Station, Kodur.—Study of the influence of root stock on growth, vigour and disease resistance of oranges and limes and mangoes, planting out mangoes on polyembryonic root-stocks, selection and propagation of off-season bearing varieties of mangoes, taxonomical studies for classification and nomenclature and multiplication and supply of budded plants of citrus and grafts of mangoes to the public. Programme of work as approved by the Imperial Council of Agricultural Research will be carried out.

Dry Farming Station, Hagari.—Cyclic crosses of H. 1 with other reputed cotton types and selection of fruitful combinations, the effect of environment on the important characters of H. 1 in certain localities, comparison of E.C. 593 and R. 42 with the local types, improvement of safflower, Bengalgram and onions, the effect of ploughing to different depths, bunding and strip cropping in Anantapur red soils, study of moisture movement in the soil, its relations with crop yields and the study of run off and shrinkage values of the soils in relation to the development of hard layer, the study of root systems of setaria, sorghum and cotton by the trench method, the improvement of setaria and sorghum by pure line selection and trial of promising selections in ryots' fields.

Nandyal.—Selection work on cotton and jonna and trial of strains of Bengalgram, redgram, groundnut, trial of garden crops, such as, vegetables, lucerne, berseem, Cambodia cotton, chillies, onions, garlic, tobacco, soya beans, and compost and silage making.

Side lines.—Training of short course students in side lines of farming, such as, Surati goat breeding, Iri-silk spinning, bee-keeping, rabbit breeding and rope making.

Palur—Sugarcane.—Varietal and manurial trials, raising of canes to find out the minimum cost of production and seed multiplication.

Paddy.—Trial of Aduturai and Coimbatore strains in the first and second crop seasons and of disease resistant and short duration varieties and multiplication of promising strains.

Other crops.—Selections of ragi, cumbu, tenai, varagu and groundnut, and harvesting trials to find out the correct time to obtain good yield and good quality kernels.

Aduturai—Paddy.—Multiplication and distribution of bulk strains, comparative trials, manurial and cultural trials.

Other crops.—Growing of green manures, plantains, sugar-cane, soya beans, turmeric, vegetables and fruit trees.

Side lines.—Bee-keeping and Pisciculture.

Pattukkottai—Paddy.—Trial of Coimbatore and Aduturai strains in single and double crop areas, manurial trials with composts.

Other crops.—Trial of sugarcane, turmeric, plantains, groundnut, cotton and ragi.

Koilpatti—Cotton.—Selection 4929 as an irrigated cotton will be continued. Multiplication of selfed K.1 and trial of single plant selection of K.1 will continue.

Cholam and cumbu.—Comparative trials of selections and multiplication of promising strains.

Ragi.—Ragi strains with E.C. 24 will be continued. Short duration types will be isolated from E.C. 3517 and Muthu ragi for summer.

Other crops.—Trial of promising types of panivaragu, groundnut, tobacco, castor, maize, berseem and Ipomea Hispida.

Ambasamudram—Paddy.—Pure line selections and inter-varietal trials, growing of dhaincha for green manure and cultivation of pulse crops.

Pattambi.—Improvement of local varieties, introduction of exotic types, inter-varietal trials, hybridization and mutation work, cultural and manurial trials.

Other crops.—Improvement work on sugarcane, pine-apple, plantains, cotton, samai and groundnuts, and cultivation of Napier grass and castor in Modan lands.

Taliparamba.—Existing practice of cropping in both wet and dry lands for multiplication of improved varieties of paddy, sugarcane, chillies, ginger will be continued. The fruit nursery area will be extended to supply fruit plants.

Bee-keeping and Pisciculture will be continued for demonstration.

Nanjanad—Potato.—Comparative trial of potato crosses and multiplication of Great Scot seed for distribution.

Other crops.—Australian wheats, Aberyswyth winter oats, Pusa wheats and barley will be tried.

General.—Electro-culture experiments such as jacketing and sparking, seed treatment of paddy and sparking irrigation water to the sugarcane and other irrigated crops, wherever possible.

Trial plots.

First Circle.—Cultural, varietal and manurial trials pertaining to paddy, sugarcane, ragi, jonna and groundnut.

Second Circle.—Experiments on reduction of seed-rate, trial of blast resistant varieties, trial of exotic varieties of cotton, korra and jonna compared with local strains.

Third Circle.—Trial of cotton strains, groundnut, tobacco, sugarcane, samba and kuruvai strains, ragi, Bengalgram and redgram varieties. Trial of Virginia tobacco and chillies from Guntur.

Fourth Circle.—Trial of improved strains of paddy produced at Pattambi and bulk strains of Taliparamba, trial of sugarcane varieties in the Kalianpur Factory area, trial of improved strains of Pusa wheat and barley and H.22 ragi and potato varieties in the Nilgiris, further trials of Uganda Cambodia hybrids in the Coimbatore district. Trials of improved varieties of millets, groundnut, gingelly and Bengalgram.

Demonstration.

(1) *Crops.*—The distribution of popular strains of paddy, sugarcane, cotton, oil seeds, potatoes, etc., and growing them in demonstration plots, raising of thin nurseries and economic planting of paddy, planting of sugarcane in lines wide apart, intercultivation with bullock power, advice on the importance of roguing and clean cultivation and extension of areas under various improved strains and supply of fruit plants.

(2) *Implements.*—Demonstration and introduction of improved ploughs, guntakas, junior hoes, chaff-cutters, buck-scrapers, bund-formers, roll-easy mhote wheels, water-lifts and improved mills.

(3) *Manures.*—Demonstration of the improved methods of preservation of cattle manures, manufacture of composts by the Indore process and Bangalore process wherever possible including Municipal and Panchayat areas, and supply of chemical fertilizers.

(4) *Seed supply.*—Multiplication and distribution of improved varieties of cotton, paddy, sugarcane, ragi, cholam and other crops suitable to each locality.

(5) *Jaggery manufacture.*—Demonstration of the preparation of good quality jaggery by the use of improved boiling pans and Sindewahe furnaces, and manufacture of cream jaggery and manufacture of white sugar with centrifugal machines.

(6) *Pests and diseases.*—Investigation of various pests and diseases and demonstration of remedial measures.

(7) Exhibitions and Conferences on festival occasions, Jamabandi camps, co-operative conferences, Health Week celebrations will be continued. Distribution of departmental publications, issue of Radio talks on Agricultural matters will be continued.

(8) Formation of Agricultural Associations and Co-operative loan and sale societies will be attended to.

I have the honour to be,

Sir,

Your most obedient servant,

P. H. RAMA REDDI,
Director of Agriculture.

GLOSSARY.

Apple	*Pyrus malus.*
Arecanut	*Areca catichu.*
Barley	*Hordeum vulgaro.*
Bengalgram	*Cicer arietinum.*
Ber	*Zizyphus jujuba.*
Betel vine	*Piper betel.*
Blackgram	*Phaseolus mungo var. Radiatus, hook.*
Brinjal	*Solanum melongena.*
Buchu	*Barcsma betulina.*
Cardamom	*Elettaria cardamomum.*
Carrots	*Daucus carota.*
Cashewnut	*Anacardium occidentale.*
Castor	*Ricinus communis.*
Chillies	*Capsicum sp.*
Cholam	*Sorghum vulgare.*
Clove	*Eugenia caryophyllata, Thunb.*
Coconut	*Cocos nucifera.*
Coffee	*Coffea arabica.*
Cotton	*Gossypium.*
(i) Cambodia cotton	*Gossypium hirsutum.*
(ii) Karunganni cotton	*Gossypium indicum.*
(iii) Uppam cotton	*Gossypium herbaceum.*
(iv) Pulichai cotton	*Gossypium neglectum.*
(v) Westerns cotton (vi) Northerns cotton	} *Mixture of gossypium herbaceum* and *indicum.*
(vii) Roseum cotton	*Gossypium var. Rosea, watt.*
(viii) Nadam cotton	*Gossypium var. Nadam, watt.*
Coriander	*Coriandrum sativum.*
Cowpea	*Vigna catiang.*
Cumbu	*Pennisetum typhoideum.*
Dhaincha	*Sesbania aculeata.*
Durian	*Durio zibethinus, Dc.*
Elephant grass	*Pennisetum purpurea.*
Field beans	*Dolichos lablab.*
Figs	*Ficus carica.*
Garlic	*Allium sativum.*
Gingelly	*Sesamum indicum.*
Ginger	*Zingiber officinale.*
Gogu	*Hibiscus cannabinus.*
Grape-vine	*Citrus decumana.*
Greengram	*Phaseolus mungo.*
Groundnut	*Arachis hypogœa.*
Guava	*Psidium guyava, Linn.*
Guinea grass	*Panicum maximum.*

Horsegram	*Dolichos biflorus.*
Indigo	*Indigofera sumatrana.*
Jack	*Artocarpus integrifolia, Linn.*
Jalap	*Ipomea purga.*
Kikyu grass	*Pennisetum clandestinum.*
Kolingi	*Tephrosia purpurea.*
Kollaganjeru	*Ipomea hispida.*
Kolukkattai grass	*Pennisetum cenchroides.*
Korra	*Setaria italica.*
Lime	*Citrus acida.*
Linseed	*Linum usitatissimum.*
Loquats	*Eriobotrya Japonica.*
Lucerne	*Medicago sativa.*
Maize	*Zea mays.*
Mangoes	*Mangifera indica, Linn.*
Mangosteen	*Garcinia mangostana.*
Mustard	*Brassica juncea.*
Neem	*Azadirachta indica.*
Oats	*Avena sativa.*
Onions	*Allium sativum.*
Oranges	*Citrus aurantium.*
Paddy	*Oryza sativa.*
Panivaragu	*Panicum miliaceum.*
Palmyra	*Borassus flabellifer.*
Papaya	*Carica papaya.*
Peach	*Persica vulgaris.*
Pears	*Pyrus communis.*
Pepper	*Piper nigrum.*
Pillipesara	*Phaseolus trilobus, Ait.*
Pineapple	*Ananas sativa.*
Plantain	*Musa sapientum.*
Plums	*Prunus salicina.*
Pomegranate	*Punica granatum, Linn.*
Potato	*Solanum tuberosum.*
Pungam	*Pongamia glabra.*
Radish	*Raphanus sativas, Linn.*
Ragi	*Eleusine coracana.*
Redgram	*Cajanus indicus.*
Royal Palm	*Oreodora regia.*
Safflower	*Carthamus tinctorius.*
Samai	*Panicum miliare.*
Sapota	*Achras sapota.*
Soya beans	*Glycine soja.*
Strawberries	*Fragaria vesca.*
Sugarcane	*Saccharum officinarum.*
Sunnhemp	*Crotolaria juncea.*
Tamarind	*Tamarindus indica, Linn.*
Tapioca	*Manihout utilissima.*
Tenai	*Setaria italica.*
Teosinte	*Euchlæna, mexicæna—Schrad.*

Tobacco	*Nicotiana tabacum.*
Tomato	*Cyphomandra betacea.*
Travellers' tree	*Ravenala madagascariensis.*
Tung oil plant	*Aleurities fordii.*
Turmeric	*Curcuma longa.*
Variga	*Panicum miliaceum.*
Varagu	*Paspalum scrobiculatum.*
Water hyacinth	*Eichhornia crassipes, Solms.*
Wheat	*Triticum spp.*
Wild indigo	*Tephrosia purpurea.*

Government of Madras

DEVELOPMENT DEPARTMENT

G.O. No. 26, 3rd January 1940

Agriculture—Administration Report for 1938–39—Recorded with remarks.

READ—the following paper :—

From the Director of Agriculture, Madras, dated 31st October 1939, No. D. 3. 68-Pdl. 39.

Order—No. 26, Development, dated 3rd January 1940.

Recorded.

2. This is the first report under the orders issued recently that the annual report of the Agricultural department should in future cover the fasli year, July to June, which corresponds to the agricultural year instead of the financial year, and the present report covers a period of fifteen months from 1st April 1938 to 30th June 1939.

3. *Administrative changes.*—An important change effected during the year is the reamalgamation of teaching sections with research sections in the Agricultural College and Research Institute, Coimbatore. Under this arrangement, closer association has been restored between teaching and research, the heads of science sections becoming responsible for teaching in their subjects. The seniormost officer in the research sections for the time being is entrusted with the administrative duties of Principal of the College in addition to his teaching and research duties as head of his section.

The Government decided during the year to replace the gazetted Superintendents at the crop-breeding stations by non-gazetted senior upper subordinates. The post of Superintendent, Koilpatti Research Station, was abolished in February 1939 and those of Superintendents at Maruteru (West Godavari district), Aduthurai (Tanjore district) and Pattambi (Malabar district) were abolished in July 1939 just after the close of the period under review. The stations are now in charge of senior upper subordinates.

4. *A. Agricultural education.*—As usual, besides the degree course, short courses of instruction in certain aspects of agriculture were continued in the Agricultural College. These short courses are useful to those who are anxious to learn within a short period improved methods that might be of use to them in agricultural

practice. Arrangements were also made from this year to afford better training to students of the degree course in curd and ghee making by increasing the number of hours in dairy practice. The short course in fruit culture and nursery practices which was started during 1937–38 at the Fruit Research Station, Kodur, was continued during the year.

B. Research—(a) Chemistry.—The Chemistry section was engaged in investigating problems concerning soil science, bio-chemistry of plants, animal nutrition and jaggery and malt-making. A number of samples of soils, manures, animal foodstuffs and fodders, water for irrigation purposes, human foods in jails and hospitals and other agricultural produce for the public and Government departments were analysed during the year. The work on reclamation of alkaline soils was continued in the Kattalai High Level channel area in the Kulittalai taluk of the Trichinopoly district. The analysis of plots treated with gypsum which is available in abundance in the adjacent taluk, Perambalur, showed marked improvement. Similar experiments were carried out in the alkaline fields in the Central Farm at Coimbatore. Studies on the effect of irrigation on black soils were commenced at the Agricultural Research Station, Siruguppa, during the year and preliminary investigations were also started for ascertaining the quantity of organic carbon present in black soils of the Bellary district. Investigations into animal nutrition led to the formulation of feeding standards of work bullocks with paddy, cholam-straw and a variety of concentrates on the basis of protein requirements. Cholam malt was supplied to the Surgeon-General, Madras, for tests in Government hospitals. The reports were generally favourable and the tests were also extended to private hosiptals. Malt was prepared successfully from ragi and rice also.

(b) *Systematic botany.*—The Botany and Herbarium Section identified 1,630 specimens for the Herbarium and for officers of various departments and also for the Chemical Examiner, the Tea Scientific Officer, the Government Museum, a few educational institutions and other officials and private individuals. Several additions of plants were made during the year in the Botanical Gardens, Ootacamund, and many improvements made to keep up the ornamental effect of the gardens.

C. Crop breeding—(1) *Paddy.*—Important work was done in the Paddy Section. Three more new strains of paddy have been released for distribution during the year under the names of Ptb. 11, Adt. 18 and Adt. 19. There are more than twenty improved strains both hybrid and pure line, awaiting release. Some of them possess special characteristics and some are intended to withstand submersion and blasts. Cultural experiments such as testing the effect regarding yield of graded seed, spacing, transplanting and broadcasting were continued. Manurial experiments were also in progress. It is found that green manuring is best suited for paddy crop; improved methods of storing and preserving cattle manure have also been brought to the notice of ryots.

(2) *Millets.*—Several selections of cholam were studied. At Coimbatore crosses were obtained between five African and local varieties of cholam and these are under further trial. A survey of cumbu varieties and their distribution was started during the year and was finished in nine taluks of Coimbatore and four of Salem district. A number of strains of ragi were under trial in the districts and at the agricultural stations at Coimbatore, Hagari and Anakapalle. Tenai strains were under trial in Coimbatore and Hagari.

(3) *Cotton.*—In the cotton section a large number of crosses were made between the Co. 2 and foreign varieties and a good number of plants with good lint length and high ginning percentage have been obtained during the year.

Schemes financed by the Indian Central Cotton Committee.—The Cotton Section worked during the year three schemes financed by the Indian Central Cotton Committee, the Mungari Cotton Breeding Scheme, the Nadam Cotton Breeding Scheme, and the botanical part of the Pempheres and Physiological Scheme. The object of the Mungari Cotton Scheme is the isolation of one or more medium staple strains required to replace the short-stapled inferior Mungari cotton grown on the red and mixed soils of the Ceded districts, while the purpose of the Nadam Cotton Scheme is to obtain an annual strain which could supplant the perennial Nadam cotton in parts of Coimbatore, Salem and Trichinopoly districts where it serves as a breeding ground for the stem weevil. Under the Pempheres and Physiological Scheme, the entomological and physiological parts were terminated in October 1938 and the botanical side alone was continued and an intensive study at Coimbatore and Srivilliputtur was made of the progenies of the crosses between Co. 2 (Cambodia) and the South American types resistant to stem weevil attack. The object in view was practically achieved by obtaining one strain at Srivilliputtur and eight strains at Coimbatore which could withstand well the attack of the pest.

(4) *Sugarcane.*—Comparative trials of different varieties of sugarcane under varying conditions were carried on during the year at Anakapalle and its sub-station, Gudiyattam, and to a smaller extent at Samalkot and Palur. At Anakapalle a large number of varieties of sugarcane received during the past five years from the Imperial Sugarcane Research Station, Coimbatore, were studied for their classification into early, mid-season and late-maturing types and at Gudiyattam a large number of new varieties received from Coimbatore were under observation for the purpose of carrying forward the promising among them for preliminary yield tests next year. Tests were carried of, the different methods for preservation of planting and studies were made in ripeness of cane varieties. Comparative tests of cane varieties were made at Gudiyattam, and at Samalkot trench planting was studied.

(5) *Tobacco.*—Strains of tobacco suited for cigar and cigarette were under trial. Two strains of the latter released by the department have spread over a lakh of acres in Guntur while two strains of the former will be put out in the districts shortly. The practice of mixing sand with tobacco still persists in South Kanara and it is hoped that the growers and tradesmen will realize the immense harm this practice is doing to business in tobacco and endeavour to put a stop to it.

Oil seeds.—Research work on groundnut, gingelly, castor and coconut was continued. There was increased demand for improved strains for groundnut and 60,094 lb. of seed was distributed. One strain of gingelly giving 24 per cent extra yield has been issued to cultivators. Selection and seed multiplication for distribution of castor strains were attended to.

(6) *Fruit research.*—Interest in growing fruit has been considerably stimulated in the Province by the work done at the Fruit Research station at Anantarajupet near Kodur in Cuddapah. Trials at the station for improving the technique of bud-insertion, for ascertaining the best time of lopping the stocks after budding, and the best season for budding have yielded useful results. The station supplies reliable plants of known parentage propagated from trees of proved merit. Root stock trials were conducted with several varieties of citrus and mango. Definite progress has been made in working out a system of nomenclature and classification of South Indian mangoes. Detailed morphological descriptions of 156 varieties have been recorded. At Coimbatore morphological studies of bananas were continued. At the Coonoor, Burliar and Kallar Gardens a number of trees of poor bearing were removed to provide for better spacing and room for better varieties. Similar studies of fruit grown in the plains were carried out at Anakapalle, Guntur and Taliparamba. Special Assistants were sanctioned for fruit work at Anakapalle and Guntur and at Taliparamba and Kodur the establishment of special fruit nurseries was also sanctioned.

D. Plant pathology.—Special attention was devoted in the Entomology and Mycology sections to making a thorough study of the pests and diseases attacking plants for the purpose of devising suitable methods of control. One of the methods of dealing with these pests tried by the plant pathology sections recently was to multiply natural enemies in large numbers and liberating them, but this method was attended with little success. Another method of combating the pests and diseases was to breed new strains of crop resistant to them. This has been done in the case of stem-weevil on Cambodia cotton and rust on paddy. Details of the experiments conducted in the sections have been mentioned in paragraph 23 of the report.

E. Demonstration and propaganda—(1) *Trial plots.*—"Trial" plots are those where the results obtained from the Research Stations in respect of the various new strains of the

different crops are tested for their yielding capacity, etc., before the ryots are called upon to adopt them. There was an increase of nearly 400 plots during the year. There were in addition 350 observation plots for noting the general behaviour of certain other new strains which had not completed the yield tests on Research Stations. Practical demonstrations on ryots' own lands follow the tests in trial plots and there were during the year as many as 8,740 demonstration plots in the ryots' lands spread over the whole province as against 7,963 in 1937–38. Three hundred and seventy-nine exhibitions and shows were held during the year against 352 in the previous year. The two annual exhibitions held during the year, one at the Congress House, Madras, and the other at the South Indian Athletic Association grounds in Madras proved useful for educating both the urban and rural population in the activities of the Agricultural Department.

(2) *Methods of cultivation.*—The department continued its propaganda in regard to the reduction of seed rate and transplantation of seedlings in paddy, in popularizing ridge sowing in cotton, in popularizing planting of sugarcane in lines with greater spacing in advocating sowing of groundnut in every line; in contour planting of potatoes and in application of green manure in combination of phosphatic manures. The total area under improved methods of planting paddy and economizing seed has increased from 950,000 acres in 1933–34 to 1,327,462 acres in the year under review. Over 52,600 acres were under improved methods of cultivation in sugarcane.

(3) *Seed distribution.*—Satisfactory work has been done in the distribution of seeds of different crops by the department. Improved strains of paddy were distributed to an extent of 8,247 tons against 1,677 tons in 1933–34 and the area under improved strains is computed to be over 1,700,000 acres. Large quantities of seed of improved strains of sugarcane, cotton and sorghum were distributed. The total area under improved strains of these crops and ragi in the Presidency also correspondingly increased.

(4) *Bee-keeping.*—Considerable progress has been made in studies in bee-keeping, a cottage industry useful to the ryot especially in the lean seasons. One thousand nine hundred bee-hives are now maintained in this Presidency. In view of the increased popularity which this industry has attained recently this department held demonstrations in hiving wild colonies and in the management of apiaries. A comb foundation machine was obtained from America for the supply of comb foundation sheets. With the starting of central apiaries in Chittoor and in Pithapuram in East Godavari district very great stimulus was given to bee-keeping in these districts and a number of hives established. Special messengers for hiving wild colonies were also sanctioned in the Trichinopoly and Tinnevelly districts.

(5) *Implements.*—The Research Engineer's section carried on work on improving agricultural implements and machinery. A number of demonstrations were conducted with improved implements and a large number of implements were sold. The demand for improved implements made in India has been on the increase year after year. The number of ploughs purchased by ryots during the year increased to 6,608 from 5,257 in 1937–38. A firm in Coimbatore is attempting to manufacture iron ploughs and other implements with the co-operation of the Research Engineer. Of the ploughs approved by the Research Engineer, Cooper No. 11 continued to be most popular, next in demand being the small Cooper No. 25 and Gurjar No. 2. The small size ridge plough, designed by the Research Engineer has been gaining popularity and 257 ploughs of this type were sold during the year.

5. *Agricultural Marketing*—(1) *Survey and Grade Standards.*—During the year marketing survey reports on six commodities, viz., citrus fruit, wool and hair, barley, coconut, sheep and goats and mangoes were completed. A preliminary report on sugar was also furnished to the Agricultural Marketing Adviser to the Government of India. Two rice-grading stations, one at Nellore and another at Kuttalam were opened during the year. Grade specifications for mangoes and oranges also were drawn up and the work of grading the two commodities was started at Chittoor and Madras respectively. The Egg Grading Station in Chinnaganjam (Guntur) continued to function and investigation is in progress for starting grading work in the Madras City. Grading of tobacco has been undertaken in Guntur in collaboration with the Indian Tobacco Association.

(2) *Co-operative Societies and Agricultural Associations.*—As in the previous year, co-operative societies, especially Loan and Sale Societies, continued to give assistance to ryots in granting loans on the pledge of produce, in the disposal of produce of its members and in the distribution of pure seed. The Loan and Sale Societies at Anakapalle, Nandyal and Marudur, the Sivagnanam Agricultural Society at Lalgudi, the grade growers' society at Michaelpalayam, the Tiruppur Co-operative Sale Society, the Egg Marketing Society, Ongole and the Nilgiris Potato Growers' Society deserve special mention in this connexion. Several Agricultural Associations also continued to do useful work particularly in arranging exhibitions and shows. The Fruit Growers' Association at Vizagapatam conducted a fruit show during the year as in 1937–38.

(3) *Commercial Crops Markets Act.*—The object of the Act is to provide for the grower of commercial crops like cotton, groundnut and tobacco the advantages of an open market where he can bring his produce for sale and get a fair price for it. Market yards and godowns are opened in suitable centres in the notified areas where the grower can stock his produce and conduct sales. Illegal deductions in trade are not allowed in the notified area. Correct weighments are made by licensed weighmen and the grower will

be exempt from all charges and allowances on his produce. A nominal levy is made on the crops and the amount collected is used to run the market in a regulated and fair manner. The rules under the Act provide for the fair conduct of transactions and facilities are also offered for realization of higher prices for better quality. The Market Committee provides also marketing intelligence in its area.

The Tiruppur Cotton Market Committee constituted under the Madras Commercial Crops Act continued during the year which was the third year of its working. The Act was extended to the South Arcot district from 1st April 1939 in respect of groundnut and to the Guntur district and to the Bezwada taluk (Kistna district) in respect of tobacco. Market Committees in Cuddalore and Guntur were established and the Committees started to function. The Act has also been extended in respect of cotton to the Adoni Municipal area (Bellary) and the Nandyal Municipal area (Kurnool) from 1st October 1939. Committees in these two areas have been established and they are settling preliminaries for starting work.

The Government have granted a loan to the Tiruppur Market Committee for the purchase of the local cotton market known as the Holmes market so that it can provide facilities for trade in the notified area. Loans have also been given to the committees at Cuddalore, Adoni and Nandyal to enable them to make a beginning in working the Act.

(By order of His Excellency the Governor)

C. P. KARUNAKARA MENON,
Secretary to Government.

To the Director of Agriculture.
,, Director of Veterinary Services.
,, Registrar of Co-operative Societies.
,, Education and Public Health Department.
,, Public Works Department.
,, Public Department.
,, Accountant-General.
,, Government of India, Department of Education, Health and Lands (with C.L.).

Press.